HOW SOME FIRMS GROW FASTER THAN OTHERS: A study of UK built environment professional service firms (SIC 2003: 7420)

By

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Abstract

The report investigates how professional service firms within the construction industry grow and the consequences of fast growth. It is particularly interesting in learning about the factors contributing to varying rates of growth along the four major growth dimensions. The research attempts to answer propositions which have been generated from the application of well known theories, looking at the objectives and constraints to growth illustrated in the literature review. Primary (company account) sources are used for collecting data which is analysed using both quantitative and empirical methods. The analysis of the data will present factors intrinsic to varying rates of growth and the findings of this report will offer a discussion as to whether firms growing at different rates tend to show a balanced. The report will then make recommendations for further action which are based upon the findings and experiences encountered from this research.

Key Words

Professional Service Firm, Rates of Growth, Balanced Growth, Strategy, Financial data.

Word Count

10,488 words excluding equations, titles, figures, contents pages, bibliography and appendices.

Contents

List of Figures

1 Introduction

1.1 Overview

There are two schools of thought on the general purpose of a firm. The management textbooks explain the purpose of the firm to be multi-faceted in that the general purposes of a firm are to make profit, act as an income medium for their stakeholder(s), serve customers and provide employment as well as meet broader societal objectives (Smyth, 2006). The other view is from an economic approach to the purpose of a firm. Many economists believe the purpose of a firm is solely to maximise shareholder value, which involves maximising the present value of expected future profits (Davies and Lam, 2001). This means a) maximise profit per share and b) issue extra shares so long as the firm can earn a return on capital greater than the shareholders' opportunity cost of capital. In this view, other stakeholders are only considered in so far as satisfying the stakeholders in the long run help profits.

To make profits grow, it may require the firm to grow in terms of turnover (see in particular 'PIMS principle', below). This in turn may require growth in the number of employees.

Observation of some professional service firms (PSFs) has revealed that a number of firms have remained the size they were from conception, some firms have been liquidated, other firms have grown gradually and some firms have grown faster than others (Penrose, 1995).

The intention of this study is to learn as much as possible, within the given time constraints, how some firms grow faster than others (and the consequences of fast growth) in the context of those firms providing professional services to the built environment. We will explore various concepts pertaining to the rate of growth of the

firm and develop a testable hypothesis which will be broken down into a series of propositions for analysis using empirical research methods.

1.2 Scope

This study includes the major firms providing professional services to the built environment within the UK. The firms have been selected using UK Standard Industry Classification (SIC) code 7240 (2003), which include the major disciplines of Engineering, Architecture, Surveying, Project Management as well as other related technical consultancies. Industry data which is required for the purposes of this study can be found in FAME which is an online database of company accounts. We will study ten years worth of data for each company, which is the number of past years' accounts held in the database. This will allow us to analyse the growth of the companies over the medium term.

The advantage of using company data from the above source is that it gives us access to the vast majority of companies operating within the capacity of providing professional services to the construction industry. However, this method does not allow us to examine firms whose legal form is Partnerships. Nowadays, fewer firms remain partnerships as it is found to have a limiting effect on the growth of the firm (OPSI, 2000). It is in any case extremely difficult to gain access to the accounts of Partnerships as these firms are not recognised as legal entities and therefore are not required by law to disclose any financial data. Given the constraints of time, it would not have been feasible to include firms acting as partnerships in this study. It is questionable whether financial data for a sufficient number of partnerships could be obtained at all.
In order to select the number of firms included in this research, a lower limit to the size of each firm (at the end of the period) in terms of the number of employees has been imposed (150 employees). This action serves to group the total number of firms under analysis to a manageable quantity which we will be better able to study under the given

time constraints. Another justification for the decision to impose a lower limit to the sizes of firms under analysis is to control for the differences between large companies and very small companies. Penrose (1995) argues that the differences in structure exhibited by very small and the very large firms are 'so great that in many ways it is hard to see the two species are of the same genus'.

1.3 Research Objectives

In order to further knowledge in relation to growth of professional service firms within the UK construction industry, we propose to investigate the range of relationships between profit, rates of growth and other objectives such as security and survival.

This report aims to offer insight to existing businesses, students, academics and those interested in studying the growth of firms who may be curious to learn of the strategies the firms under analysis use in order to grow faster. The findings of this report may well aid future decision makers who would like their firms to grow faster.

A review of literature relating to firms within the construction industry shows abundant published information on construction firms.

1.4 Existing Literature

Growth of Firms in General

Literature pertaining to growth of the firm is plentiful. In particular, economists of the twentieth century have made important contributions to the theory of the growth of the firm, such as Alfred Marshall (1920) in which he offers the widely accepted theory of the representative firm. Edith Penrose (1959, 1st ed.) later recognises Marshall's work and goes on to publish pioneering work regarding the theory of the growth of the firm. With respect to management, Michael Porter is a leading authority on management, competition and strategy.

Growth of Professional Service Firms

Coxe et al. (1987) offered Success Strategies for Design Professionals which contains advice for architecture, engineering, interior design and other design oriented PSFs. They present the Superpositioning matrix as a game plan for building successful design practices.

Dunn & Baker (2003) draw from their experiences of accounting and law firms as well as other industries to make most significant contributions in recent times by trying to change the way PSFs are viewed. Their work comprises of a critique of aspects of standard management theory such as the predominant practice equation;

$$Revenue = People\ Power \times Efficiency \times Hourly\ Rate.$$

Amongst other theories Dunn and Baker (2003) offer an adapted theory for explaining the success of firms and offer a new practice equation;

$$Profitability = Intellectual\ Capital \times Price \times Effectiveness.$$

Growth of Construction Firms

An important contribution to the knowledge of growth of contractors came when the Science and Engineering Research Council commissioned a programme of research into Construction Management during the eighties, as a result of which three books were published relating to contracting firms (Hillebrandt and Cannon, 1989). Graduates from the Bartlett have also contributed to this group of literature; Zoioploulos (2003) has looked at whether diversified construction groups can achieve superior financial performance than autonomous business units with particular reference to economies of scale and scope. Literature on the growth of contracting firms are abundant, however there is limited published information on the growth of consulting firms within the UK regarding those providing professional services to the built environment.

Growth of Professional Service Firms within the Construction Industry

There have been some past MSc reports by students at The Bartlett, UCL who have broached topics relating to the growth of the professional service firms. Kazim (1994) wrote an interesting paper on market development for professional practices and Tjandra (1999) also contributed to this group of literature with research into 'Competitive Strategy of Architectural Practices in the Changing Market' This report draws upon the existing literature on firms in general, professional service firms and firms within the construction industry.

1.5 Outline

The framework for this research builds on literature from several disciplines, including economics, marketing, organisation and management theory. The focus is essentially strategic management.

This chapter defines the scope of the study and draws attention to why the proposed research may offer additional knowledge to the growth of consultant firms. In particular, the firms providing professional services to the built environment.

Chapter two sets the background to the growth of firms. Drawing on a range of economic and management literature, factors of growth and strategies firms use are discussed. Chapter three provides propositions which have been derived from the literature reviewed and explains the framework for collecting and analysing the data. Chapter four provides an in-depth analysis of the findings. The last chapter discusses the conclusions of the analysis and highlights the implications of the findings for the problem owners, which in this case are the shareholders. A framework for further research is also proposed in this chapter.

2 Literature Review

2.1 The Firm

2.1.1 The Generic Firm

Any enterprise is an institution formed to achieve certain aims and objectives (Smyth, 2006). The firm is such an enterprise whose purpose can be to act as a means of generating a living for the key stakeholder (generally tends to be the owner/manager). Other purposes are to make profit, serve customers, and provide employment or to meet broader societal objectives (Smyth, 2006). The mission of a firm or its long term ambition is generally described in a more qualitative form (Hillebrandt and Cannon, 1989). Firms meet their objectives by deploying various strategies, these objectives tend to be finite in time and are considered in quantitative terms over the short term (Ibid., 1989). Penrose (1995) defines a firm to be:

> "a collection of resources bound together by an administrative framework, the boundaries of which are determined by the 'area of administrative coordination' and 'authoritative communication'".

It should be noted however that there are two views of a firm. Management literature describes the objective of a firm to be multi-faceted such as those described above. The economic view as to the purpose of a firm is solely to maximise the shareholder value of expected future profits. It tends to only view other stakeholder objectives in so far as satisfying these stakeholders in the long-run helps profits.

2.1.2 The Professional Service Firm

Aharoni (1993) suggests that in the early eighties PSFs account for almost one-half of GDP in developing countries and two-thirds of GDP in developed countries. He also goes on to say that employment in the professional business services has grown much faster than other sectors of the economy. This view is reinforced by Winch and Schneider (1993) who agree that the business services sector was the fastest growing sector of the economy. The share of PSFs contributing to national GDP is increasing rapidly (Lowendahl, 2005). Lowendahl (2005) provides an explanation as to the reason for the increase in popularity of PSFs in that services are essential to providing quality.

Lowendahl (2005) summarises the three existing fundamental characteristics of professional services typically discussed in literature in that they are:

- Intangible
- Instantaneous
- Produced in close interaction with the buyers

Lowendahl (2001) provides us with a definition of what constitutes a professional service firm (PSF). He adds to the three existing characteristics described above and defines an 'ideal' typology for PSFs. Lowendahl goes on to admit that not all PSFs deliver just these services but develop standardised methodologies to achieve economies of scale but stresses that the majority of services offered by the firm should be of a professional nature instead of a standardised one.

Lowendahl (2001) identifies key characteristics of the PSF which have been summarised below:

1. PSFs provide knowledge intensive services and are delivered by highly educated employees, who are frequently closely linked with research and scientific development within their area of expertise.

2. Services are based on a professional assessment (diagnosis) by experts in the field; they then involve a high degree of personal judgement by the experts involved.
3. Services are customised to each client's needs
4. Delivery involves a high degree of interaction with the clients representatives, for diagnosis as well as delivery.
5. Individuals belonging to PSFs are typically trained in a standardised body of knowledge, which is common to all professionals in that sector and is certified by the relevant professional authority
6. Services are constrained by professional norms of conduct, including setting clients needs higher than profits and respecting the limits of professional expertise.

2.2 Growth

A clarification of what we mean by 'growth' is required as there are two diametrically opposite theories that can be found in the literature. Literature published before 1980s tend to refer to growth as growth of the firm's turnover. When economists such as Penrose (1959) and Marris (1964) referred to the term growth, its implicit reference was to growth of turnover. The firm was assumed to be manager controlled and the objective of the managers of the firm was growth of turnover and employees for reasons such as power and status. In order to achieve that, they required profits to grow as the means of financing growth of turnover. Nowadays the firm is assumed to be controlled by the shareholders whose primary objective is the growth of profits (Brealy et al., 2006). Modern literature speaks of growth in terms of the growth of the firm's profits and other growth variables, such as turnover and number of employees are just a means to that end.

For the purposes of this paper, the term 'growth' will implicitly refer to growth in terms of rate of growth (ROG) of profits unless it is used in relation to any of the other measures of growth.

2.2.1 Measures of growth

All firms have varying objectives in relation to the growth of their firm (Smyth, 2006). It is the primary focus of the firm which will dictate the direction in which they grow (Porter, 2004). A firm may grow in four principal directions which we will use in our research to measure growth:

1. Growth of its profits
2. Growth of its sales or turnover
3. Growth of its capital employed
4. Growth of its number of employees

There are two more monetary variables we will be interested in regarding their effect on growth:

5. Growth of its shareholders' funds
6. Growth of its of debt

Profit

It is important to understand the motivations for growth. Penrose (1995) offers factors such as power, public approval, prestige or a 'mere love of the game' as reasons for motivation behind growth of turnover and states that in order to achieve any or all of the above, the firm must seek and have the ability to make profits. Profits are usually assessed relative to some gauge such as net assets or sales revenue (Brealy et al., 2006). Definitions of profit are given below:

$$Profit\ (£) = Total\ Revenue - Total\ Costs$$

$$Profitability = \frac{Profit}{Capital\ Employed}$$

$$Profit\ Margin = \frac{Profit}{Turnover}$$

$$Profit\ per\ Employee\ (£/emp) = \frac{Profit}{No\ of\ Employees}$$

Turnover

Revenue from sales or turnover of a firm is important factor in gauging the market share of that firm (Lines et al., 2007). Turnover (or gross output) is one factor upon which the size of the firm can be measured.

$$Turnover\ (£) = Total\ Sales = av.price\ per\ unit\ x\ quantity\ sold$$

Capital Employed

Capital employed is the total financial assets of the firm and provides the funds for obtaining both tangible and intangible assets. Capital employed includes all loans, share capital and reserves (Lines et al., 2007). In this paper, we use the following relationship to define Capital Employed:

$$Capital\ Employed(£) = Total\ Assets - Current\ Liabilities$$

Number of Employees

The size of a firm can be measured using the number of employees employed by the firm.

Shareholders Funds

This is the capital employed minus any value of debt. 'Maximising shareholder value' means maximising stock market valuation of shareholders funds.

$$Shareholders' Funds\ or\ Equity\ (£) = Capital\ Employed - Debt$$

Debt

It would be interesting to learn whether the level of debt a firm may have affects their growth rate, as borrowing is one of the ways a firm may finance its growth. Gearing ratio is the level of a firm's debt compared with its equity capital. There are many different ways in which Gearing Ratio is defined. For this research, we have defined it as below.

$$Gearing\ Ratio = \frac{(Short\ term\ loans\ \&\ overdrafts + Long\ term\ liabilities)}{Shareholder's\ Funds}$$

2.2.2 Means of growth

For the firms to grow in any or all of the above directions, there are two methods in which they may grow: (Patel, 1995).

- *Organic (Internal) growth*: the growth a firm can achieve by utilising human and other resources internal to the firm so that it may profitably supply goods and services to the market (Penrose, 1995). It is the improvement in quality as a result of an internal process of development leading to cumulative movements in any one direction (ibid., 1995).

- *Growth by Aquisition/Diversification*: the growth a firm can achieve (increasing output and enhancing sales and therefore increasing profits) by acquiring resources

external to the original firm. The external resources may come from takeovers, acquisitions or mergers (Mueller, 1987).

We will explore the means of growth in more detail later on in this chapter (2.6 Strategies for Growth).

2.2.3 Resources and Limits to Growth

We have to assume that a firm actually wants to grow, whether growth is defined in terms of profits (Brealy et al., 2006) or in terms of turnover and employees (Penrose, 1959), even if its strategy is a defensive one. Lack of enterprise in any firm will substantially limit its growth (Penrose, 1995). Inefficient management, insufficient capital raising ability, lack of adaptability to changing circumstances, poor judgement leading to frequent and costly mistakes or simply bad luck due to circumstances beyond their control are further reasons for severely limiting growth (ibid., 1995). It may well be considered that lack of enterprise will limit growth whether it is in terms of profit or turnover.

Price Elasticity of Demand

Price elasticity of demand facing many PSFs is high (elastic), therefore total turnover can be increased by cutting margins and thus prices (figure 1). If however, some PSFs offer highly differentiated services, they will face inelastic demand (figure 2), and a positive rather than negative relationship between price and margin on one hand and turnover growth on the other (Davies and Lamb, 2001).

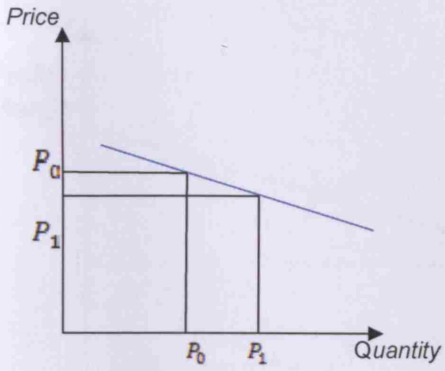

Figure 1: Elastic Demand

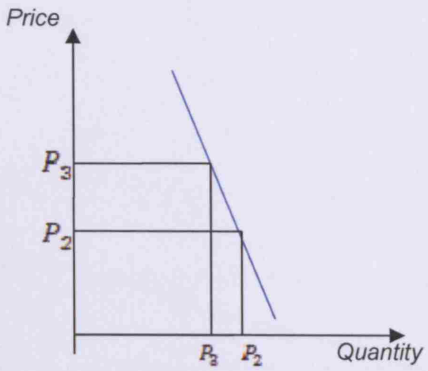

Figure 2: Inelastic Demand

Figure 3 shows the negative relationship between the growth rate of turnover and profit margin which has been adapted from Eichner-Wood model (Gruneberg and Ive, 2000). Gruneberg and Ive (2000) explain price and hence the level of profit margin is governed by the need for investment and growth. There is a point beyond which a profit oriented firm won't push the growth rate of turnover.

A profit constrained firm feels the managers will accept a certain drop in profit margins as long as it stays above a level that satisfies shareholders. A profit unconstrained firm (a firm that doesn't have to satisfy shareholders interest, of which admittedly there are very few if any) can drive high growth in turnover by cutting their selling prices, thus limiting their profit margin. This type of firm could grow up to the point where the minimum level of profit would have to be achieved which would enable the firm to finance its growth.

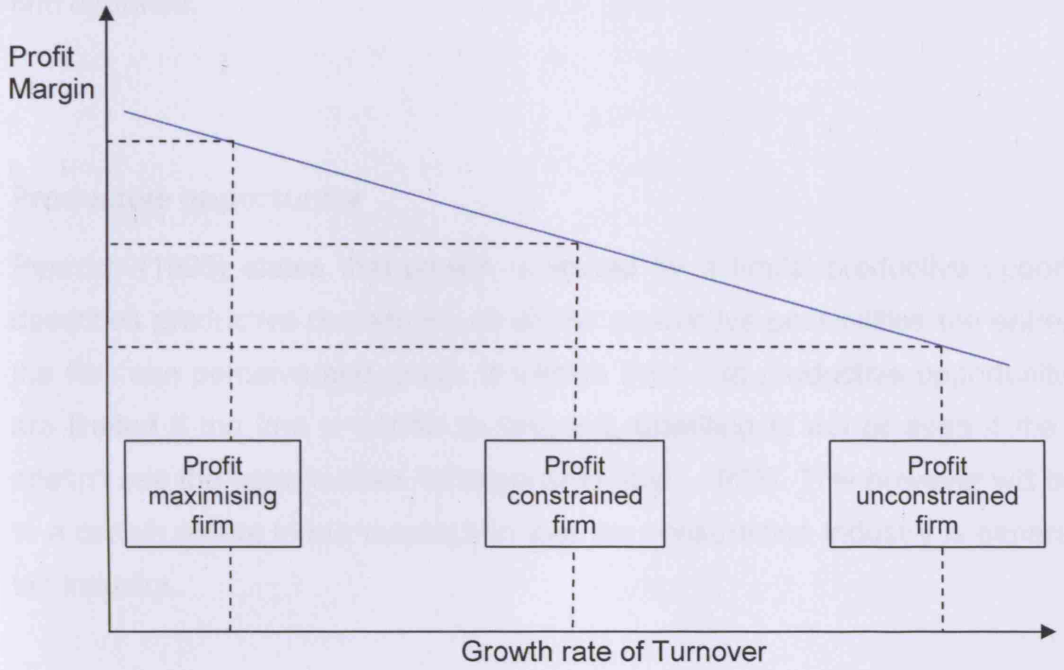

Figure 3: Negative relationship between Profit Margin and growth rate of Turnover

Financial Constraint

By their very nature, PSFs sell a *service* which is uniquely tailored for each customer. Their financial assets tend to be limited to the property that the firm may own. Unlike contracting firms PSFs don't have plant or equipment against which they may borrow finances from lenders, so there generally three ways for a PSF to finance growth:

1) Borrowing
2) Retain existing profits
3) Issue new shares

Lenders tend to be reluctant to lend unless the PSF own property as security. Profits can only be retained if it is combined with the wishes of the shareholders; and new shares can only be issued if the PSF is operating under certain ownership types. The

finance of growth may be constrained further by the ownership type under which the firm operates.

Productive opportunity

Penrose (1995) states that growth is limited by a firm's 'productive opportunity'. She describes productive opportunity as all the productive possibilities the entrepreneurs of the firm can perceive and grasp. It follows then that productive opportunities for firms are limited if the firm is unable to respond, unwilling to act or even if the firm simply doesn't see the opportunities for expansion (ibid., 1995). This however will be controlled to a certain extent in our research in that the construction industry is generally a client-led industry.

Management

Penrose (1959) was one the first economists to make a fundamental contribution to identifying 'effective management capability' as a critical barrier to growth. Before her contributions to theory of the growth of the firm, capacity of a firm was widely regarded to be its amount of fixed stock and capital (Neo-classical model). When firms grow by mergers and acquiring other firms, the existing core management plays an important role in facilitating the integration of the additional resources inherited by the firm as a result of the merger or acquisition. Once a substantial increment of growth is completed, the managerial services devoted to it become available for further expansion (Penrose, 1995).

A shift in the focus of managers also has a limiting effect on growth. Originally managers used to retain nearly all their profits in order to finance the growth of their firms. Managers are increasingly obliged to pay out much of the profits of the firm to shareholders as dividends (Penrose, 1995). Due to changes in the way stock markets operated in during the eighties, firms were made more vulnerable to takeover. This resulted in a shift in the objectives of managers. A manager's income used to depend

on the size of the firm, managers interested in increasing their income would concentrate on the growth of their turnover (and employees). Whereas the main objectives of shareholder controlled corporations is to maximise profits. These firms pay management large bonuses that are linked to profits. By changing remuneration systems so that top managers' remuneration is tied very tightly to the share price and profit, shareholders can influence the shift in managers' objectives. This is especially true for firms which are PLCs, moreover it applies to firms that are quoted on the stock market.

For Private Limited companies where there is no share market and therefore no share price, remuneration of top managers has to be different. Managers' bonuses are tied to the accounting profit. As this method motivates managers to take short-run decisions (as maximising present years profit will maximise present year's salary package), some firms make their managers shareholders in order to deter managers from making short-run decisions. Managers who have shares with a limited resale market as in the case of those working in private limited companies (as shares aren't quoted on the stock exchange), managers have to maximise the long term profitability of the firm as a way of maximising the long term value of their shares and the stream of dividends from their shares.

Size

The size of a firm (in terms of number of employees), is limited by the extent to which administrative effectiveness can continue to reach its expanding boundaries (Penrose, 1995). Penrose (1995) observes that both administrative structure and managerial functions are reorganised as a firm grows in order to deal with the larger firm more effectively.

Knowledge and Value Added

Penrose (1995) argues that the role of growth in knowledge is critical in increasing the rate of growth of the firm. It can be argued that the more you know and the more

experience you have, the performance of the employees add synergy to the overall productivity of the firm. These firms are known as Knowledge Based Organisations (KBO) or Organisations that learn (Winch and Schneider, 1993). KBOs assume that the organisation has knowledge which goes above and beyond the sum of its employees. The impact of the role of knowledge has on ROG of firms, can be indirectly be measured as *value added.*

$$Value\ Added\ (£) = Remuneration\ (wages, salaries, pension) + Profit$$

Human Capital, Trust and cooperation

Human capital is assumed to contribute to the strategic positioning and competitive advantage of firms (Skaggs and Youndt, 2004). Hatch and Dyer (2004) agree with this view and find that investments in firm-specific human capital have a significant impact on learning and firm performance. Human capital is said to be inimitable based on its intangible, firm-specific, and socially complex nature Hatch and Dyer (2004).

Penrose argued that it was easier for a firm to increase its stock of fixed capital than it was to increase its stock of management capability. Of the two different management techniques (hard and soft systems), she applies a more qualitative approach to capacity and growth. Initially, capacity was thought to be related to the output corresponding to the stock of fixed capital of the firm. Penrosian theory suggests increasing capacity of the firm so that it may grow then change the scale of operation fundamentally relies on recruiting more key staff (fee earners as well as managers), allowing time for them to integrate into the firm, gain experience and restructure if required. Penrose identifies a strong social and psychological culture (later coined 'emotional intelligence') within most large firms. Such firms place importance on emotional intelligence for effective internal management and the development on mutual trust. Smyth (2005) identifies trust as an important competence for establishing effective relationships. This can be seen in design teams who often work with each other repeatedly. Smyth (2005) points out that this removes the 'learning curve' thus improving effectiveness and efficiency.

2.3 Profit Impact of Market Strategy (PIMS) Principles

Covering a wide variety of industries and markets, PIMS database uses information pooled from many business units to analyse strategic decisions pursued by firms (Varadarajan, 1989). PIMS principles are general relationships rather than 'laws of strategy' which have been analysed using PIMS database. Some of the findings by PIMS researchers can be seen in figure 4.

1	In the long run, the most important single factor affecting a business unit's performance is the quality of its products and services relative to those of its competitors.
2	Market share and profitability are strongly related.
3	High investment intensity acts as a powerful drag on profitability.
4	Vertical integration is a profitable strategy for some kinds of businesses, but not others.
5	Most of the factors that boost ROI also contribute to long-term value.

Figure 4: Some PIMS principles (Varadarajan, 1989)

2.4 Ownership Types

There are essentially five different ownership types of the firm, each with its own advantages and disadvantages. Each ownership type serves to suit the various backgrounds from which a firm emerges. Firms may act as sole traders or partnerships, they can be privately owned or publically quoted (Smyth, 2006).

- Sole Proprietorship (Sole Traders)
- Partnerships
- LLPs
- LTDs (private)
- PLCs (public)

Sole Proprietorship

This is the simplest form of ownership type and has the simplest legal structure. The legal entity is that of its owner and has no separate existence from its owner. Not many PSFs use this legal structure. Sole proprietorships are governed by civil law and do not benefit from limited liability (debts of the business are debts of the owner). This type of firm does not pay corporate taxes, the owner pays income taxes on profits made and so tax returns and general business accounting is made simpler. It is also difficult to raise capital, as there are no shares that can be sold.

Partnership

Historically all PSFs were partnerships (Lowendahl, 2005) until the 1980s when Private Limited Companies became a more popular ownership type. Partnership may comprise of 2 – 20 partners who share the ownership of the firm as well as the profits and losses. It is not a legal entity and is governed by The Partnership Act 1890 (OPSI, 2000). No dividend taxes are levied and no taxes are incurred on profits before it is distributed amongst the partners but are however, subject to income tax on income as trading income. Partnerships tended not to be as profit seeking as more recent Limited form of companies. Partners actually work in the business and have a diverse range of objective other than just profit such as status and prestige. Partners are also exposed to greater liability than limited companies, they are jointly and severally liable for the actions of another partner. This in itself was a major limiting factor for growth, although it attracts business to the partnership firm as it signals competence (Penrose, 1995). Lack of ambition or fears of losing management control are other limiting factors of growth.

Limited Liability Partnerships (LLP)

This is a fairly new ownership form; an LLP is a legal entity, separate from the owners. Partners are still heavily involved in the management of the business and as investors they are better placed to make informed decisions. Liability is limited to the amount of capital each member contributes to the LLP and is governed by a hybrid system of law constituting part partnership law and part company law (Limited Liability Partnerships

Act, 2000). As with Partnerships members regarded as self-employed and are subject to income tax on income as trading income. LLPs require at least two partners who are liable for actions of the other member(s). Relationship of partners are governed by specific agreement between partners, in the absence of any agreement, the LLP act provides regulations specifying a default form of agreement.

Private Limited Companies (Ltd)

Private Limited Companies became popular during the eighties. The ideology was that the firms acting under the new ownership type were inclined to be more profit seeking and could seize profit opportunities that conservatively minded partnership form missed. Although the resale market for shares is limited, investors tend to be more knowledgeable of the business and better placed to make long-run decisions for the firm. Limited companies are regulated by the Companies Act 2006 (OPSI, 2006) and must register with Companies House, an Executive Agency of the Department for Business, Enterprise and Regulatory Reform.

Public Limited Companies (plc)

Public Limited Companies are regulated by the Companies Act 2006, (OPSI, 2006). An advantage of this ownership type is that it can be easier to raise funds to finance growth however, selling shares to investors who are not knowledgeable about PSFs within the construction industry can often be detrimental to the business. PLCs must also register with Companies House and contribute at least £50,000-worth of share capital, of which at least 25% must have been paid for. A minimum of two shareholders and two directors (one of whom may also be the company secretary) is required.

2.5 Business Models

2.5.1 Long-run Business Model

PSFs generally tend to follow a long run business model instead of having neo-classical short-run characteristics (Figure 5). In the long-run, firms may have varying amounts of capital and other inputs as opposed to a fixed amount of capital (as in short-run models). Davies and Lam (2001) show the long run cost curve to comprise of several short run curves and explain the behaviour of long run costs depend on economies of scale (Figure 6). Profits in the long run is said to maximise shareholders' wealth. Larger firms are able to raise capital by borrowing money at more attractive, cheaper rates than their smaller counterparts. Lending institutions tend to favour larger firms as they are seen to be 'less risky' as they themselves tend to be diversified. Larger PSFs can produce economies of scale by having more elaborate division of labour compared to their smaller counterparts. Adam Smith's model of division of labour by having more specialisation within the firm adds to economies of scale enjoyed by larger firms.

Diseconomies of scale is the reverse, output is less than double even if input is doubled. One of the main diseconomies of scale comes from managerial diseconomies. When a firm expands significantly, the strata of middle management has to be introduced. The rule of thumb is that managers are able to cope with a span of control of up to six

personnel. New strata of middle management may become less efficient, and as they wouldn't necessarily have salary linked to the profitability of the firm, middle management may not have much incentive to reduce costs or to be as entrepreneurially effective as top managers.

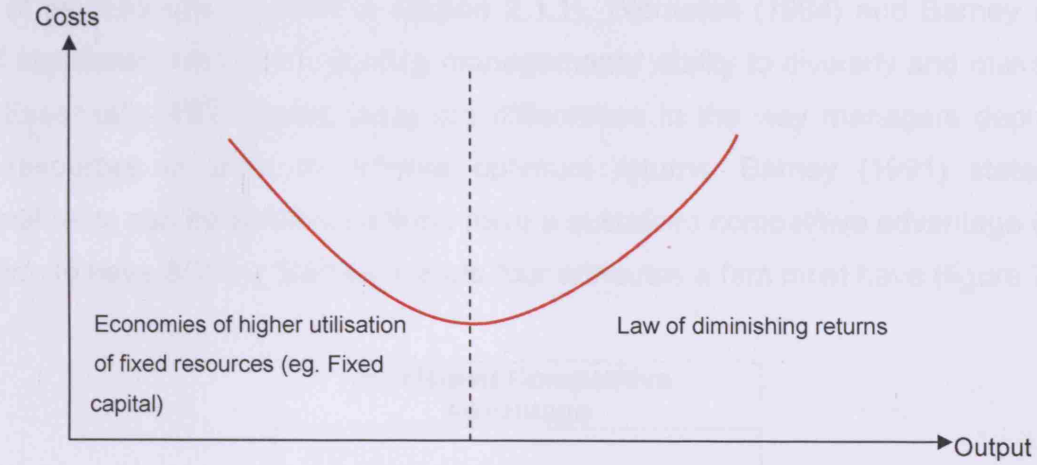

Figure 5: Short-run cost curve (adapted from Brealy et al., 2006)

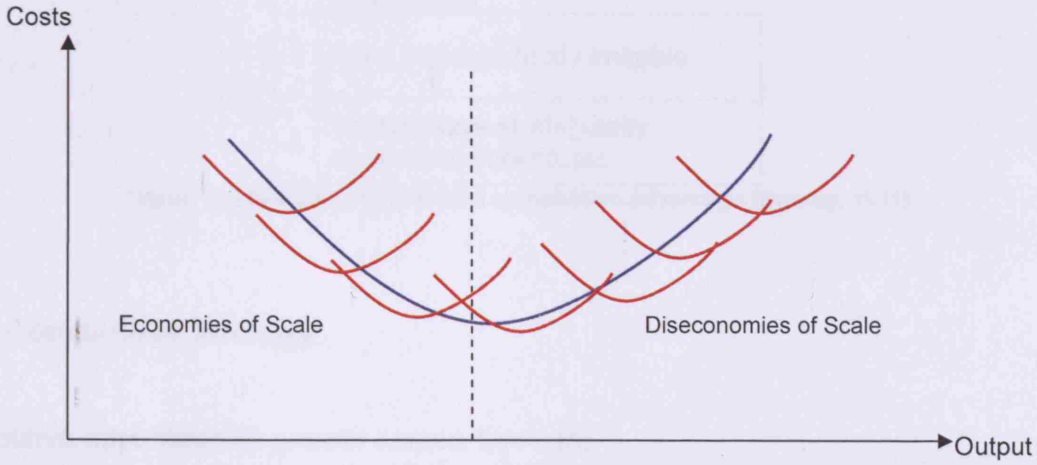

Figure 6: Long-run cost curve (adapted from Davies and Lam, 2001)

2.6 Strategies for Growth

2.6.1 Resource Based View (RBV)

Penrose (1959) was one of the first economists to describe the function of a firm in terms of its resources (quoted in section 2.1.1). Wernefelt (1984) and Barney (1991) played significant roles in highlighting managements' ability to diversify and make firms grow. Essentially RBV argues there are differences in the way managers deploy the firm's resources in order to achieve optimum returns. Barney (1991) states that abnormal rents can be achieved if firms have a sustained competitive advantage (SCS). For a firm to have SCS(s), Barney depicts four attributes a firm must have (figure 7).

	Sustained Competitive Advantage
1	must be valuable by exploiting opportunities or neutralizing threats in a firm's environment
2	must be rare among the firm's current and potential competition
3	must be imperfectly imitable
4	cannot have strategically equivalent substitutes

Figure 7: Attributes of sustained competitive advantage (Barney, 1991)

2.6.2 Competitive Strategy

Competitive advantage of growth comes through:

1) Cost leadership,
2) Risk spreading
3) Seizing new profitable opportunities & diversification

4) Brand/reputation (as a client led industry, you can only grow if clients invite you to tender into their markets and those invitations depend on your reputation)
5) Firms are driven to expand to remain competitive (Penrose, 1995; Johnson & Scholes, 2006)

Industry attractiveness and the relative position of the firms within the industry are determinants of a firm's profitability (Porter, 2004).

Porter (2004) claims competitive strategy is developed from having a deep understanding for the rules of competition that determines the attractiveness of an industry. Porter's widely accepted forces diagram articulates these rules of competition (figure 8). He argues these rules of competition (embodied in the five competitive forces) can be applied to any industry producing products or services, regardless of the local, national or international market they are in.

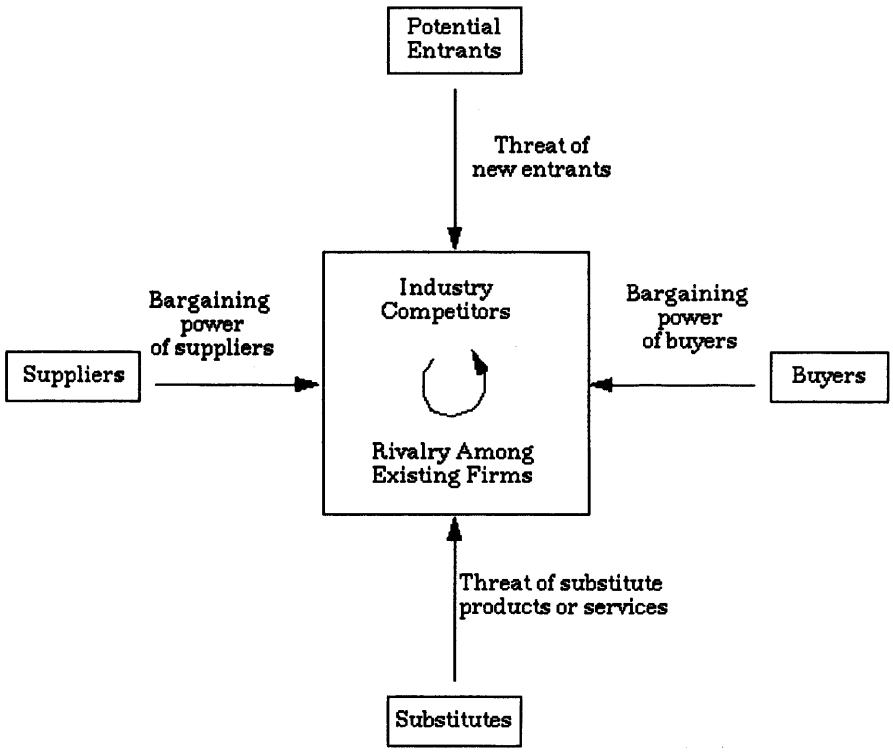

Figure 8: Porter's 5 Forces diagram (Porter, 2004)

Porter (2004) argues a firm's relative position within the industry determines whether their profitability is above or below industry average. Firm's whose profitability is relatively high is thought to have a 'sustainable competitive advantage'. Porter's Generic Strategies (figure 9) stems from his following statement:

> "The significance of any strength or weakness a firm possesses is ultimately a function of its impact on relative cost or differentiation."
>
> Porter, 2004

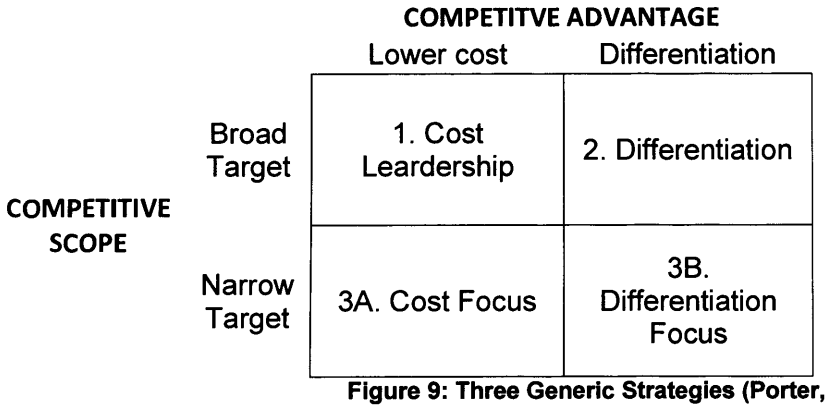

Figure 9: Three Generic Strategies (Porter, 2004)

1. Cost Leadership: attaining competitive advantage by becoming a 'low cost producer' in its industry. Sources of cost advantage can include pursuing economies of scale, proprietary technology or preferential access to raw materials as well as other factors.
2. Differentiation: Firms seeking to be 'unique' by choosing to position itself to meet one or more attributes that are widely valued by buyers in that industry.
3. Focus: Firms choosing to pursue this strategy "selects a segment or group of segments in the industry and tailors its strategy to serving them to the exclusion of others". (Porter, 2004)

Porter's three generic strategies later drew some criticism (Winch and Schnieder, 1993; Gurau, 2007), in that they can be rendered obsolete. Some of the reasons for

supporting this view stems from the recognition of the change in market conditions. Gurau (2007) argues that new competitive conditions requires the model to be updated and re-formulated so that it can support more recent business ideas and theories which have since been identified and applied by business professionals and academics. Winch and Schneider (1993) argue that Porters Generic Strategies cannot directly be applied to KBOs as his typologies were developed in the context of manufacturing industries.

2.6.3 Diversification

Zoiopoulos (2003) provides a definition for diversification as:

> "the process by which firms extend the range of their business operations outside those in which they are currently engaged"

Diversification is used by many firms as a strategy for achieving growth. Figure 10 gives a breakdown of the details in this method.

Diversification		
1	**Vertical Integration:** occurs when a firm moves up or down a supply chain. It reduces costs and offers a 'seemless' service for clients.	*Forward Integration:* extending operations to include following stages of production (down supply chain).
		Backward Integration: moving into previous stages of production (up supply chain).
2	**Horizontal Diversification:** spreads risk by entering related markets using current skill base. Secures market penetration due to relatedness of markets.	
3	**Diversification by Geography:** Staying in the same industry, whilst extending into local/regional markets, or extending to domestic and international markets.	

Figure 10: Methods of Diversification

Although originally published over fifty years ago, Ansoff's (1957) Product-Market matrix is a powerful and popular tool which firms are still using today. His matrix method helps firms understand the risks involved in pursuing various growth via diversification

strategies which include a combination of entering new markets and or consolidating existing markets together with using existing products and or offering new products. Ansoff reiterates strategists' belief that firms who are presently market leaders still have to 'keep abreast in the race of innovation and competition' or will otherwise limit their growth opportunities by losing their market share and concede to their competitors.

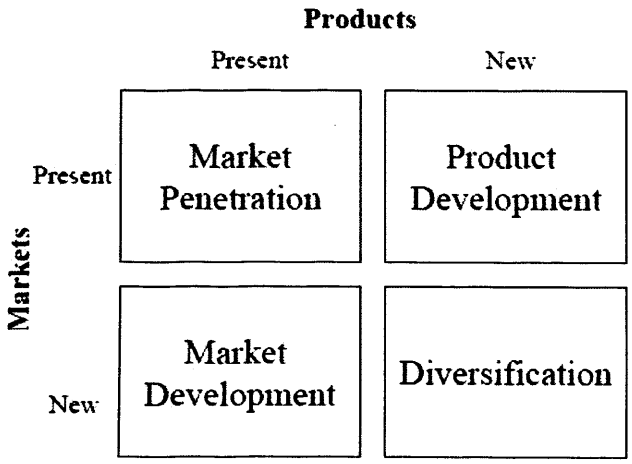

Figure 11: Ansoff's Product-Market Matrix for Business Growth Alternatives

Ansoff (1957) uses a matrix format (figure 11) to illustrate his growth alternatives for a firm. Ansoff's model has four growth strategies, see figure 12.

1	Market Penetration	The firm penetrates it's present market with existing products and may achieve growth by increasing market share. This is the simplest form and carries the least risk if firms follow this growth strategy.
2	Product Development	Stays in the same market but develops products that have new and different characteristics such that will improve performance of that market.
3	Market Development	Company attempts to adapt its present product line to enter new markets, generally with some modification in the product characteristics.
4	Diversification	Carries the most risk over the previous three growth alternatives which 'require a break with past patterns and traditions of a company and an entry into new and uncharted paths'.

Figure 12: Ansoff's Strategies for Diversification (Ansoff, 1957)

Zoiopoulos (2003) concurs with the Ansoff framework for growth, finding that firms who have diversified into markets or products with which they share common skills or resources exhibited the highest profitability, and firms which diversified into unrelated businesses resulted in the lowest profitability.

2.7 The Knowledge Based Organisation

Winch and Schneider (1993) have termed those firms providing professional services within the business service sector the Knowledge Based Organisation (KBO). They derived the term from Sveiby and Risling's (1986) description 'kunskapsforetaget' which translates to the 'knowledge firm'.

KBOs organise their resources in a particular way because Winch and Schnider argue these types of firms 'sells a capacity to produce, rather than a product' and so possess a 'standardised intangibility' in that the product is intangible and cannot be traded as a commodity and yet standardised so that it achieves differentiation over services provided by others. KBOs can be distinguished in three dimensions as stated in figure 13.

1st Dimension	Distinctive competence in how they mobilise their standard intangibilities:	- Performing a transactional role and act as third parties (accountants, lawyers, quantity surveyors)
		- Providing creative solutions for client's problems (architects, advertising agencies, management consultants, media production companies)
		- Providing technological solutions for clients (consulting engineers)
2nd Dimension	Characteristics of the labour market in which they belong to:	- Highly structured labour markets where skills are regulated by professional association and accredited courses (accountancy, law, architecture, engineering)
		- Labour markets that aren't professionalized and are less well regulated (advertising, management consultancy)
3rd Dimension	Dimension: Regulation dictates whether each KBO can work at a national or international level:	- International level – Most KBOs can operate at this level because they can work for trans-national firms (advertising, accountancy)
		- National level – restricted to this level due to regulatory systems and cultural issues (law, architecture)

Figure 13: Distinguishable characteristics of KBOs (Winch & Schneider, 1993)

Winch and Schnider (1993) evaluate the pros and cons of both Porter's (2004) Generic Strategies and Maister's Super Positioning Matrix (Cox et al., 1987). KBOs can use Porters five forces to identify their competitive contexts. Winch and Schnider build upon and propose a new model based on a 2 x 2 matrix (figure 14) which advocates four generic strategies using two dimensions; the Aesthetic Quality Preference (can be determined by professional peers or the client). Each strategy is tabulated in Figure 15.

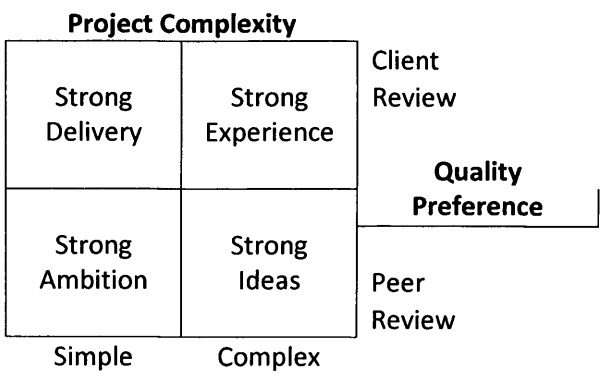

Figure 14: Winch & Schneider's Strategy model

Strategy	Description	
Strong Delivery	Practices deliver designs for relatively simple building types at less than average fees, but at high level of profitability through effective organization of the design process.	
	They make extensive use of repeat building elements, rely on CAD and have high ratio of technicians to architects or simply have low overheads.	
	Typically these firms will be functionally organized, but may deploy strong project management to ensure delivery performance.	
Strong Experience	Established practices deploy their experience for the clients more demanding requirements such as:	Complex or unusual building types
		difficulties over planning permission
		sheer size of the project
		ability to value engineer the design
	Can charge premium fees as their contributions to the project releases value for the client	
	Large (multidisciplinary) practices, or firms specializing in limited range of building types.	
Strong Ideas	Can charge premium fees due to their reputation within the profession for original and exciting ideas and will often be important players in the debates around architectural style.	
	Emphasis is more on conception than realization (eg. winning competitions)	
	Often these practices are organized on a studio basis with a strong, even charismatic figurehead.	
	Market for this type of work is limited, possibly due to the strongly identifiable styles.	
Strong Ambition	Newly formed practices with high ambitions and few clients	
	Charging below average fees due to lack of reputation, and sometimes subsidizing practice through other activities eg. Teaching. (this strategy not sustainable in long term)	

Figure 15: Winch & Schneider's Strategies description

3 Research Method

3.1 Hypothesis

Some firms grow faster than others because their growth due to several contributing factors, such as ownership structure and level of investment. The strategies a firm will deploy often depend on the stakeholders' motives for the firm.

Big Question

Why do some firms grow faster than others?

Are there attributes or features that the fast growing firms tend to share with one another which are not present in the slow growing firms?

Question for Present Research

How do some firms grow relatively fast? With what consequences? Are they balanced or imbalanced in their growth? Which kind of firms tend to be the fastest growers?

3.2 Method

As this research looks at only a component part of the 'bigger question', it is important to use analysis and investigation methods appropriate to the questions facing this research. We therefore propose to measure variables using a combination of empirical and statistical research, which is based on a dataset chosen by specific criteria that can be achieved within the scope of this research program.

3.2.1 Data Collection

The dataset is chosen from specific criteria so as to provide a manageable workload that can be processed within the scope of this research program.

Primary Sources

Data from firms with full accounting data that meet the selection criteria will be extracted from FAME. A ten year period ranging from 1997 through to 2007 comprises the data set used from which all components of the research have been derived; this is located in Appendix 1: Primary dataset of survey sample. A list of all variables extracted from FAME is tabulated in figure 16. Averages of initial three years are used as past values and average of most recent three years used for the present values, this process discounts for year on year fluctuations. The past and present values are then computed to provide the rate of growth (ROG) over a ten year period for each variable:

$$ROG\ (\%) = \frac{(present - past)}{past} \times 100$$

Raw data extracted from FAME (1996 -2007)	
Variable	**Units**
Turnover	£ (thousand)
Profit	£ (thousand)
Total Assets	£ (thousand)
Current Liabilities	£ (thousand)
Employees	no.
Gearing Ratio	%
Shareholder's Funds	£ (thousand)
Remuneration	£ (thousand)
Note: Total Assets - Current Liabilities = Captial Employed (£ thousand)	

Figure 16: Variables extracted from FAME

Secondary Sources

Secondary sources such as books, past theses, journal articles and internet web pages were used to comprise the literature review. Propositions tested in the analysis were formulated from the literature reviewed.

3.2.2 Selection Criteria

To collect a manageable number of firms, three selection criteria were used which can be seen in figure 17, this process returned a population of 212 firms and a survey sample of 85. Appendix 9 shows how some firms within the sample are related.

	Criteria	Justification	No. of Firms returned
Criteria 1	Primary UK SIC code (2003): 7420 Architectural and engineering activities and related technical consultancy (see appendix 2)	Larger firms do not confine themselves to just one profession. (eg. Arup, Turner & Townsend)	25,992
Criteria 2	Minimum number of Employees: 150	Limit scope to a manageable timetable (research period)	212
Criteria 3	Firms which have full accounting data	Full analysis cannot be carried out otherwise	85

Figure 17: Selection process used for collecting population and sample firms

Preliminary work was undertaken on each of the firms' balance sheets to ensure all the required data were present for each firm. Firms with incomplete data were then filtered out which presented a survey size of 85 firms. The application of these criteria returned a sampling fraction of 40%.

3.2.3 Continuous & Discreet Variables

Figure 18 presents the variables that were used in this research.

Continuous variables	Turnover
	Profit
	Capital Employed
	Gearing
	Shareholders' Funds
Discreet variables	Ownership Type
	Original or Primary Activity

Figure 18: Variables analysed in research

3.3 Analysis Methods

3.3.1 Difference in means

In cases where a lot of data has been collected and where the sample size is a fraction of the whole population to be studied, powerful inferences can be drawn from statistical analysis. Instances where one continuous and one discreet variable are used, statistical analysis such as the t-test is useful in making statements about a particular hypothesis (whether there is a significant statistical difference in the means of the two samples). The t-test is a statistical tool for measuring whether there is a significant difference in the mean values of the data under analysis, and dictates whether a null hypothesis should be accepted or rejected depending on whether the probability value returned is less than the chosen significance level. In instances the hypothesis claims there is a difference in the means, a one tailed parameter is used. Where sample sizes are unequal and the variance is assumed to be different, the following equation should be used to compute the t – test statistic (definitions can be found in appendix 8):

$$t = (\bar{X}_1 - \bar{X}_2) / (s\bar{x}_1 - \bar{x}_2)$$

where

$$s\bar{x}_1 - \bar{x}_2 = \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$$

In the case of this research, the sample size is almost half of the population. In instances where the sampling fraction is so high, it is reasonable to assume that when a large difference in the means of data exist within the given sample, inferences can be drawn just by common-sense observation that differences are likely to exist between the means of the sample and that of the population as a whole (appendix 4).

3.3.2 Regression Analysis

This is a statistical form of analysis traditionally used for forecasting. This form of analysis compares two continuous variables and helps to identify whether there is a relationship between variables, this is known as Single (or Simple) Regression analysis. Predictions regarding one variable can be made with respect to the second variable. The research will utilise this method of analysis to measure ROG of the variables against each other.

A line of best fit can be fitted on each graph whose equation is given below.

$y = a + bx$

- In the above equation b (correlation coefficient) will provide the average growth rate, having taken out the fluctuations.
- Covariance σ_{xy}, is the average of the products of deviations for each data point pair in two datasets. This is a measure of how much changes in x are associated with changes in y (see figure 19).

σ_{xy}	>	0	then x and y tend to increase or decrease together
σ_{xy}	<	0	then y tends to decrease as x increases, and vice versa
σ_{xy}	=	0	or is very small, then x and y tend to be independent of each other.

Figure 19: Analysis of covariance

3.3.3 Ratio Analysis

Ratio analysis of company financial data indicates trends within firms and can be useful in estimating overall financial conditions of the firm as well as their future objectives. Ratios allows for comparisons between companies and industries. They also allow for comparisons between different time periods for one company or between a single company and its industry average. These ratios are grouped into various accounting categories as in figure 20. Ratios used in this research are listed in Figure 21 below.

Various Ratios used in Business Analysis	
Liquidity ratios	measures the availability of cash to pay debt
Activity ratios	measure how quickly a firm converts tangible assets
Debt ratios	measure the firm's ability to service long term debt
Profitability ratios	measure the firm's use of assets and control of its expenses to generate and earning capacity of a firm (rates of return)
Market Ratios	measure response of investors to owning and the cost of issuing stock
Labour Productivity ratios	measure of how productive and efficient members of a firm are
Capital Productivity	measure how effectively capital is being used in relation to turnover

Figure 20: Ratios used to measure financial condition of firms

Ratios used	
Labor Productivity	Turnover / Employees
	Profit / Employees
	Capital Employed / Employees
Capital Productivity	Turnover / Capital Employed (Asset Turnover)
Profitability	Profit / Turnover (Profit Margin)
	Profit / Capital Employed

Figure 21: Ratios used in research

3.3.4 Dupont Analysis

This type of analysis measures how effectively assets are used. Return on Investment (ROI) can be measured by combining the effects of Profit Margin and Asset Turnover.

ROI = Profit Margin x Asset Turnover

$$\frac{\pi}{K} = \frac{\pi}{T} \quad X \quad \frac{T}{K}$$

Where:

π = Profit

K = Capital Employed

T = Turnover

3.4 Propositions

Literature reviewed in chapter 2 has provided the conceptual framework on which to base our propositions. No doubt almost all of the above factors contributing to the rate

of growth of a particular firm can be measurable to some degree. The dataset we will use in this research will allow us to measure only some of the above propositions about growth. Below is a list of all the propositions that can and cannot be tested using the dataset we will be applying in this research.

Measurable Propositions using current dataset:

P1) Growth rates (Profit) are different according to ownership types. Is a firm picked at random from a sample of PLCs more likely to show fast growth than a firm picked from a sample of LTDs?

Yes, a higher %age of PLCs are growing faster than LTDs.

P2) Can we see a difference between those who provide creative solutions and those who provide technological solutions (Winch & Schneider's model) Is there a difference in the rates of growth according to initial activity (Architects & Engineers)? Is a firm picked at random from a sample of Architects more likely to show faster growth than a firm picked from a sample of Engineers?

No, a higher percentage of Engineers are growing faster than Architects

P3) Growth rates are different according to initial size of the firm at start of period. Faster rate of investment (measured by capital employed) has an effect on ROG of the firms.

Yes, generally the bigger the initial size of the firm, the faster the ROG of both Turnover & Profits tends to be. (Divergence)

P4) Do a higher proportion of fast growers have higher levels of debt to finance their growth (measured by gearing ratios)

Not really

P5a) Do slower growing firms exhibit the same attributes as faster growing firms?

No

P5b) Are the majority of the slow growers balanced in their growth? In this case we would expect to see profits and turnover growing in proportion to one another

Yes, the slow growers (mostly LTDs) tend to be more balanced in their rates of growth.

P5c) Are the majority of the fast growers imbalanced in their growth? Fast growth may be achieved at the expense of profitability. In this case we would expect to see ROG profits growing more slowly than ROG turnover.

Yes, fast growers exhibit imbalanced growth.

P6) PSFs tend to operate in competitive markets (where turnover can be increased by cutting prices thus profit margins); demand facing a single firm therefore tends to be elastic (Eichner-Wood relationship).

Survey sample doesn't conform to this. Survey sample can be linked to:

- *Porter's Generic strategy: differentiation*
- *Winch & Schnieder's model: 'Strong Ideas' strategy*

P7) What is the effect of ROG turnover on ROG Capital Employed with respect to the two different ownership types?

CE is growing faster than profit, representing a falling ROCE over time for PLCs but not for LTDs. LTDs tend to be balanced in their growth whereas PLCs aren't.

P8) What are the consequences of imbalanced growth? Are there diseconomies of scale for firms with imbalanced growth? Or do the bigger, faster growers

recognise economies of scale in their firm; can they achieve cost leadership over their smaller, slower competitors?

There seems to be diseconomies of scale in faster growing firms. Cost Leadership strategy doesn't seem to favour fast growing PSFs.

P9a) Higher levels of capital employed should result in increased levels of turnover per employee.

Yes, Capital Employed/Employee increases with Turnover/Employee

P9b) Higher levels of capital employed should also result in increased levels of profit per employee.

Yes, Capital Employed/Employee increases with Profit/Employee

P10) In order to get the same ROCE high profit margins will have to be offset by low asset turnover. PSFs with high profit margins are expected to have low ratio of turnover/capital employed (like developers), whereas firms with low margins are expected to have a high ratio of turnover/capital employed (such as contractors).

There is a weak relationship for PSFs, particularly private limited companies.

Immeasurable propositions using current dataset

These propositions can be found in section 5.2 (Recommendations for Further Action/Research).

4 Results

4.1 Analysis of Data

In each analysis, extreme values (which would distort results and trend patterns) in the charts have been omitted.

It cannot go unnoticed that upon inspection of the data analysed (regression analysis and ratio analysis), there are several firms who appear to be making losses.
Explanations offered as to why these firms are still trading are:

- they are heavily subsidised by a parent company,
- have the intention to change their strategies and are hoping to turn the firm around and into profit or
- there is some sort of advantage for the parent firm in keeping what appears to be unsuccessful firms going (loss leader).

Analysis of the mean of each variable using the t-test statistic returned following significant differences (figure 22). Each of the test statistics is located in appendix 8.

Continuous variable	Hypothesis of discreet variable	Probability (2sf)	Significant Statistical difference?	Confidence level (%)
Turnover	ROG PLC greater than ROG LTD	0.057	Yes	90
Turnover	ROG Eng greater than ROG Arch	0.044	Yes	95
Profit	ROG PLC greater than ROG LTD	0.23	No	-
Profit	ROG Eng greater than ROG Arch	0.00051	Yes	99
Capital Emp.	ROG PLC greater than ROG LTD	0.023	Yes	95
Capital Emp.	ROG Eng greater than ROG Arch	0.14	No	-
Employees	ROG PLC greater than ROG LTD	0.06	Yes	90
Employees	ROG Eng greater than ROG Arch	0.22	No	-
Gearing Rat.	ROG PLC greater than ROG LTD	0.13	No	-
Gearing Rat.	ROG Eng greater than ROG Arch	0.21	No	-
Sharehlds. F.	ROG PLC greater than ROG LTD	0.41	No	-
Sharehlds. F.	ROG Eng greater than ROG Arch	0.08	Yes	90
Labor Prod.	ROG PLC greater than ROG LTD	0.02	Yes	95
Labor Prod.	ROG Eng greater than ROG Arch	0.28	No	-

Figure 22: Significant differences using t-test

4.2 Analysis of Propositions

Proposition 1

Pie chart below (figure 23) gives a breakdown in ownership types of all firms within the survey sample. In order to normalise for the difference in sample sizes of each ownership type, the following method in figure 24 was used to test this proposition. Figure 24 shows 50% PLCs achieve fast growth according to the parameter set whereas 23% of LTDs exhibit fast growth. Figure 22 shows there's a significant difference in ROG Turnover for PLCs compared to ROG Turnover for LTDs. This is also the case for ROG Profit, ROG Employees and ROG Labour Productivity.

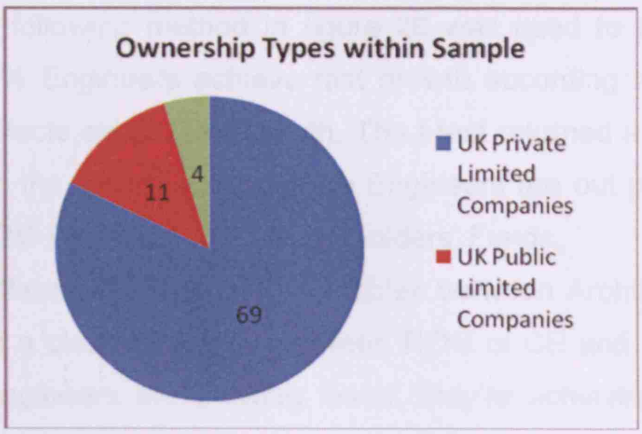

Figure 23: Breakdown of ownership types in sample

	PLCs	LTDs	Total
Fast	4	17	21
Slow	8	56	64
Total	12	73	85
Parameter: 25% of total = fast; 75% of total = slow			

Figure 24: Tabular format analysing ownership types

References:

Figure 22

Figure 23

Figure 24

Appendix 5A

Appendix 8

Proposition 2

Pie chart below (figure 25) gives a breakdown by original activity of all firms within the survey sample. In order to normalise for the difference in sample sizes of each

ownership type, the following method in figure 26 was used to test this proposition. Figure 26 shows 32% Engineers achieve fast growth according to the parameter set whereas 6% of Architects exhibit fast growth. The t-test returned a high probability that a difference between the means exists where Engineers are out performing Architects in ROG Turnover, ROG Profit and ROG Shareholders' Funds.

From the table of difference in means in variables between Architects & Engineers in appendix 5B, there's a clear difference between ROG of CE and Employees between the two activities. Engineers are growing faster, they're achieving ROG Turnover of about the same as ROG Capital Employed and their profit margins are increasing even whilst they are growing fast (in terms of ROG CE & Turnover). This either means that the UK market has been exceptionally favourable to engineers over the last ten years or there has been some internationalisation of the engineering firms.

Profits for the architects have been growing much more slowly than their turnover which has led to falling profit margins. Turnover seems to be growing at roughly the same rate as ROG Capital Employed so one side of the Dupont formula is constant whilst the other half (Profit Margin) is in steep decline. This could mean architects are facing heavy competition. Architects may be slashing their prices in order to win work or they may be losing control of their costs (perhaps by underestimating cost and overestimating productivity)

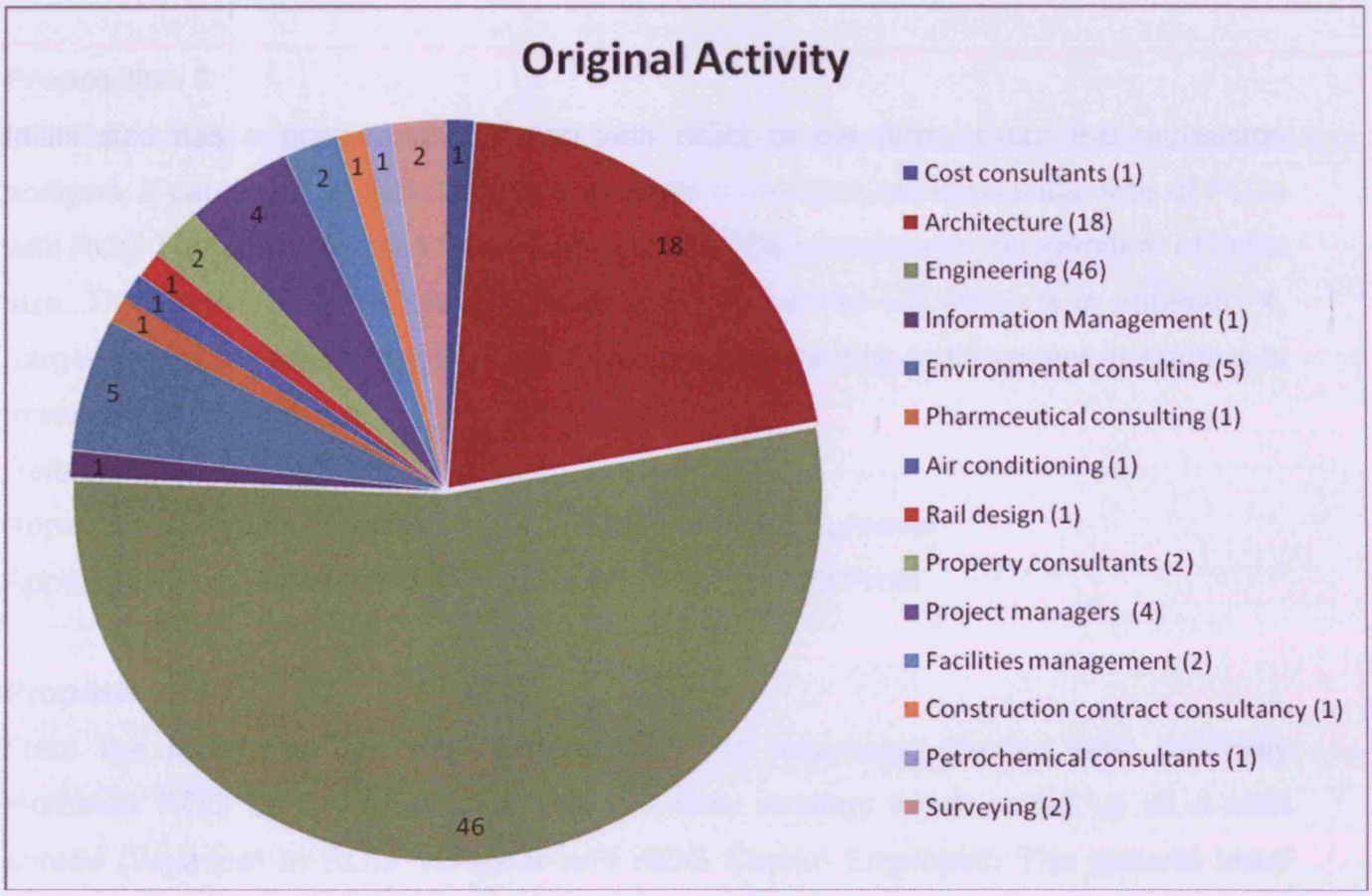

Figure 25: Original activities of survey sample

	Architects	Engineers	Total
Fast	1	15	16
Slow	17	31	48
Total	18	46	64
Parameter: 25% of total = fast; 75% of total = slow			

Figure 26: Tabular format analysing original activity of firms

Reference:

Figure 25

Figure 26

Appendix 5B

Proposition 3

Initial size has a positive relationship with ROG of the firms. From the regression analysis, it can be seen that there is a stronger correlation between initial size of PLCs with ROG Turnover, whereas ROG Turnover of LTDs seems to be independent of Initial size. This can be seen in the regression analysis carried out which is in appendix 4. Larger the initial size of firm, the faster they grow confirming a divergence according to initial size of the firm.

Reference:

Appendix 4A Impact of Initial Size Employees on ROG Turnover

Appendix 4B Impact of Initial Size of Employees on ROG Profit

Proposition 4

From the regression analysis, it does look like increasing gearing ratio modestly increases ROG Capital Employed. This is a risky strategy which shows up as a wide spread (variance) in ROG Turnover and ROG Capital Employed. The general trend seems to be that increased ROG Gearing Ratio has a decreasing effect on ROG Shareholders Funds. Regression shows ROG Gearing doesn't really influence ROG Profit. This suggests that the firms use the money in the same way (achieve same amounts of profit) whether the finance is coming from shareholders or borrowing.

Turnover tends to increase with faster ROG gearing ratio (TvG). ROG Turnover of PLCs tends to grow faster as ROG gearing ratio increases.

Shareholders get a return on capital (after gearing). As long as ROCE is higher than the cost of debt, then the more highly geared the firm is, the more it's return on shareholder's funds provided high gearing raises ROSF above ROCE.

The danger gearing poses is when ROSF falls below ROCE. In a recession, being highly geared is dangerous as interest rates tend to rise.

Reference:

Appendix 4A: Impact of ROG Gearing Ratio on ROG Turnover

Appendix 4B: Impact of ROG Gearing Ratio on ROG Profit

Appendix 4C: Impact of ROG Gearing Ratio on ROG Capital Employed

Appendix 4D: Impact of ROG Gearing Ratio on Shareholder's Funds

Proposition 5a

From the table of means appendix 5A, it does seem that rates of growth are systematically higher for the PLCs (faster growing firms) than for LTDs (slower growing firms) whichever ROG is used.

Figure 26 also shows that there are significant difference in the means of LTDs and PLCS

Proposition 5b

Yes, the slow growers tend to be more balanced in their rates of growth. This can be seen in the table of means in appendix 5A when considering LTDs as slow growers.

ROGs of variables for LTDs tend not to be disproportionate, meaning LTDs are exhibiting balanced slow growth. Regression analysis (particularly ROG Profit series appendix 4B) shows slow growers tend to be the LTDs, their trendlines tend to be closer to the 'balanced growth' line compared with PLCs

Proposition 5c

Faster growing firms (PLCs) tend to be imbalanced in their growth. ROG Profit is growing slower than ROG Turnover (Appendix 4B: Impact of ROG Turnover on ROG Profit). The fast growers seem to sacrifice relative profitability to achieve faster ROG Turnover. (they have lower than average profitability rates – their profitability rates fall over the period)

Reference:

Appendix 4B

Appendix 5

Figure 26

Appendix 8

Proposition 6

Profit margins are actually highest in the firms that are growing fastest (see regression analysis in appendix 6). Firms may face inelastic demand curves as they may have an element of monopoly in their position. In this case, firms can increase their turnover by raising profit margins (raise prices). There may be a small reduction in volume of sales but it doesn't offset the increase in price per unit of sales. The more differentiated services are, the more the demand curve facing the firm should be inelastic. This means the firms facing inelastic demand curves in the sample are providing a service that cannot be perfectly substituted by other PSFs. These firms offering substantially differentiated service can therefore raise prices.

Reference:

Appendix 6

Proposition 7

CE is growing faster than profit – representing a falling ROCE over time for PLCs but not for LTDs (appendix 4C Impact of ROG Profit on ROG Capital Employed). LTDs tend to be balanced in their growth (their trend line is closest to the balanced growth line) whereas PLCs aren't.

Profit margins have remained constant over time so profit is growing at the same rate as turnover, this can be seen in the profitability ratios in appendix 3.

There is a tendancy of CE to grow faster than turnover, as the firms don't tend to be on the balanced growth rate line. This is particularly prominent for PLCs. Meaning if CE was doubled, Turnover would less than double. This is an indication that Profit on Capital would also be falling unless profit margins were rising (DuPont relationship appendix 7).

Reference:

Appendix 3

Appendix 4C

Appendix 5

Appendix 7

Proposition 8

Turnover in very fast firms (mostly PLCs) seem to grow broadly in line with their capital employed. As PLC firms increase their inputs of both CE & labour, they are getting less than proportionate increase in turnover. Their growth is at the expense of falling profit margins (regression in appendix 7), this suggests that these fast growing firms aren't achieving economies of scale.

PLCs are behaving like managerially controlled firms described in the literature review. They are growing their turnover at the expense of ROI. If Shareholder return was to be maximised, then managers of these fast growing firms would target a slower ROG turnover as is the case with LTD companies. This way the ROSF would not tend to fall over time.

Reference:

Appendix 7

Proposition 9a

Productivity ratios of Capital Employed/Employee and Turnover/Employee should result in a positive relationship in order to prove the proposition to be correct. Regression analysis of the sample data holds true to this proposition (appendix 11a). There is a strong positive relationship as the covariance indicates; the dispersion of the datapoints are quite narrow and relatively close to the trend line.

Reference:

Appendix 11a

Appendix 4C: Impact ROG Turnover has on ROG Capital Employed

Proposition 9b

Regression analysis in appendix 11b also shows a positive relationship Capital Employed/Employee and Profit/Employee. As expected, profit/employee does grow at a slower rate than capital employed/employee (in conformance with relationship between ROG turnover and ROG profit in appendix 4B)

Reference:

Appendix 11b

Appendix 4B: Impact of ROG Turnover on ROG Profit

Proposition 10

A low value for the correlation coefficient for the 'sample firms' suggests evidence of a weak relationship, as well as the wide scatter of the firms in the regression analysis in appendix 7. This means there is a big spread on their return on capital employed (ROCE). Inspection of the Profitability ratios and of the Capital ratio used in the DuPont formula in appendix 3 shows there's not a huge spread. The biggest turnover/capital employed ratios are approximately 1.5 times greater than the smallest values, meaning that ratio moves in a relatively narrow band whereas profit margin moves in a much wider band (approximately 5 times difference between the smallest and largest ratio). This evidence suggests that firms with the higher profit margins will tend to have higher ROCE, as the higher profit margin won't be fully offset by a lower turnover/capital employed ratio. The second regression chart in appendix 7 however, shows that PLCs have a stronger relationship with the DuPont formula. PLCs can achieve the same return on capital by offsetting profit margin against asset turnover.

Reference:

Appendix 3: Profitability and Capital ratios
Appendix 7: Graph showing DuPont Relationship for sample firms

5 Conclusion and Recommendations

5.1 Conclusion

Faster growing firms tend to be imbalanced in their growth. Evidence is stronger for PLCs than for Private Ltd firms. This may be attributed to the more stringent accounting rules for PLCs, as their data is subject to examination by stock market analysts. There is more scope for private limited firms to influence the presentation of their accounting data. For example, profit a firm makes could be represented as consultant's fees, actions like these can result in distortion of key performance indicators like the firm' profit margin or productivity ratio.

Faster growing firms (tend to be disproportionately PLCs) did not conform to characteristics of the Eichner-Wood model; increasing turnover at the expense of reduced profit margins. It is usually the case that PSFs face elastic demand. However in the case of the faster growing firms analysed in this report, evidence suggests they are facing inelastic demand. Although this finding was unexpected, it is in conformance with the Winch-Schneider strategy *Strong Ideas* and Porter's second generic strategy *Differentiation.* As a consequence, this finding suggests that most firms would be more successful in growing faster by differentiating their services than originally thought.

Finding out average unit price change and volume (quantity of work done) for PSFs is very difficult. However an inference may be drawn that in instances where profit margins are increasing, firms' unit prices have been increasing. There seems to be no evidence that unit costs were falling indicating the root of success for a number of fast growers has been in achieving successful differentiation and then raise prices to reflect that.

Interestingly, the balance of evidence supports the view that engineers seem to have been more successful at differentiating that architects. Winch and Schneider point out that differentiation must be standardised. Whilst architects may produce highly

differentiated single projects, they seem to have difficulty displaying their differentiation in advance to the point of persuading clients to pay for it.

The evidence does suggest there are some firms in the sample who have achieved fast volume growth but haven't managed to maintain profitability. This indicates that those firms don't get cost advantages and looks as though they are making diseconomies of scale if anything (where scale relates to volume). According to PIMS and observations of some of the largest UK firms (such as Atkins), their success should enable increased profitability. However, it seems this isn't the case for firms from the sample; surprisingly firms have grown fast in volume but haven't been able to charge premium prices thus having trouble maintaining its profitability. As the firms tend to expand, their unit costs tend to rise relative to each unit price. This has a squeezing effect on profit margin. The falling profit margin in some of the very large firms comes from being able to make their turnover grow generally in line with their capital employed but only at the expense of limited growth in profit margins. Therefore, a firm pursuing Porter's Cost Leadership strategy seems to be less successful because the rewards of being the largest aren't that great in this field.

This finding questions whether firms know how to efficiently manage their growth. It may well be that this is a transitional phenomenon and that with time, firms will find ways of controlling costs at very large scales. On the other hand, if the proposition that this is a field where diseconomies in scale and diseconomies of very fast growth in volume exists then why are the shareholders ('owners' of the problem) allowing this? Certainly this would not maximise shareholder value. The question arises as to why shareholders aren't persuading management to pursue other strategies that do maximise shareholder value. The logical conclusion would be that the shareholders' ability to influence the firm must be limited.

To test the above hypotheses (of whether limited growth of profit margins is a transitional phenomenon or whether diseconomies exist in this field), firms involved in the sample could participate in a benchmarking exercise (see below).

5.2 Recommendations for Further Action/Research

The topic of growth of PSFs within the construction industry is vast and has remained relatively unexplored. This paper has only touched upon an initial part of the topic. To gain a more comprehensive study of the growth of PSFs further proposals for study has been suggested below which would build upon the findings of this research.

1 Propose a benchmarking exercise. Companies could agree on an anonymous basis to share management accounting data that only individual firms can provide (whats been happening to their unit costs and their volumes; in which markets have they been making profits, reporting on some identified key performance indicators such as those listed in appendix 10). Each firm can then see as a result of this exercise how its doing compared to their competitors. At the moment, individual firms wouldn't know whether they're unique or whether their experience is typical.

2 Some of the statistical tests for difference in means proved inconclusive in figure 22. Carry out further analysis using a greater number of observations of PLCs and/or use a more conventional non-parametric method to test for significance eg. Wilkoxon Rank Sum Test.

3 Evidence from the single regression analysis indicates all variables (ROG of :CE, E, Gearing, SF) all help increase ROG Profits and Turnover. It would now be interesting to learn whether ROG of Profit or Turnover is influenced by an interrelationship between the variables. (This proposition may be tested using multiple regression analysis).

4 Indeed we have proposed that all PSFs within the construction industry can be grouped together for the purpose of this study. We argued that since they were all providing professional services they can legitimately be classed into a major group by themselves. Our argument was based on the fact that we can see many of the firms within our population do not particularly regard themselves as belonging to one profession but that they themselves have diversified whether by

vertical or horizontal means, into related professions. Further empirical investigation into each individual profession may well reveal with reason, cause for a different assumption (difference of means test for each profession).

5 Semi-structured interviews could be held with firms within the sample so that a qualitative understanding can be gained as to the factors affecting growth rates of the major growth variables. Questions such as 'what are the motives for growth?', can then be asked, when this is known 'why firms grow?' can be answered.

6 Was the strategy of the firms to grow fastest a positive strategic decision or a defensive one eg. Increasing growth barriers for their competitors. (Semi-structured interviews)

7 A larger population may be generated which was beyond the scope of this paper from which the preliminary research would edit the initial population down to a sample size in which the number of firms involved in specific variables would still be significantly large enough (a minimum of approximately 20 firms per growth factor) to measure potential significance these factors contribute to the growth variables such as:

8 Ownership types: Although we concede that financial data may be extremely difficult to obtain for Partnerships, it is still possible to measure the major growth variables against the other Public Limited Companies, Private Limited Companies and Limited Liability Partnerships to some degree of confidence given that the sample of each ownership type is sufficiently large enough.

9 Initial professions of each firm: If sufficient numbers of each of the initial professions of firms were obtained, we could try to ascertain whether faster rates of growth can be achieved through organic growth or diversification. In this case we would be able to test the findings of other schools of research (PIMS principles, and test to see whether they can also apply to PSF within the UK construction industry.

10 Globalisation strategies. Firms who are subsidiaries of foreign parents may well have differences in growth rates compared to the national firms. It would be

interesting to test this proposition. In order to do this, a sufficient number of eligible firms would have to be part of the larger proposed sample set.

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Appendices

Appendix 1: Primary Dataset of Survey Sample

Appendix 1A: Turnover Data

Turnover				
Company	10 yr av.	present	past	%age growth
Name	£ thousand	£ thousand	£ thousand	over 10 years
AMEY OWR LIMITED	17,889	27,156	10,431	160
ARCADIS AYH PLC	23,873	37,962	13,064	191
ARUP NORTH AMERICA LIMITED	20,916	24,030	13,940	72
ASSYSTEM GROUP UK LIMITED	60,421	82,135	44,985	83
ASSYSTEM UK LIMITED	50,754	81,526	25,382	221
AUKETT FITZROY ROBINSON GROUP PLC	14,782	16,105	13,589	19
BECHTEL LIMITED	318,841	260,129	430,586	-40
BENOY LIMITED	12,078	20,930	7,976	162
BOVIS LEND LEASE PHARMACEUTICAL LIMITED	36,726	51,321	16,198	217
BUILDING DESIGN PARTNERSHIP LIMITED	54,053	77,113	40,712	89
BURO HAPPOLD ENGINEERS LIMITED	40,256	65,301	17,817	267
CAMERON TAYLOR ONE LIMITED	10,841	14,546	7,619	91
CAPITA SYMONDS LIMITED	72,073	140,757	24,408	477
COLIN BUCHANAN AND PARTNERS LIMITED	14,332	18,396	8,857	108
COMMTECH LIMITED	10,669	11,561	8,963	29
CORUS RAIL CONSULTANCY LTD	15,526	17,575	8,202	114
DET NORSKE VERITAS LIMITED	17,970	18,838	19,273	-2
DTZ DEBENHAM TIE LEUNG LIMITED	109,681	141,295	76,870	84
EARTH TECH ENGINEERING LIMITED	74,390	85,399	39,113	118
ELECTROWATT CONSULTANTS LIMITED	5,212	4,976	4,436	12
ENVIRON UK LIMITED	8,908	13,495	5,269	156
EPR ARCHITECTS LIMITED	7,526	8,939	5,841	53
FABER MAUNSELL LIMITED	84,806	156,572	22,942	582
FAITHFUL+GOULD LIMITED	65,648	87,947	42,316	108
FORTUM O&M (UK) LIMITED	11,578	11,460	14,881	-23
FOSTER + PARTNERS LIMITED	35,390	44,112	27,476	61
FRAZER-NASH CONSULTANCY LIMITED	12,701	23,003	5,442	323
GED SITEC LIMITED	15,940	31,251	8,041	289
GOLDER ASSOCIATES (UK) LIMITED	10,143	16,433	7,030	134
HALCROW HOLDINGS LIMITED	194,877	284,968	126,431	125

HASKONING UK LIMITED	24,782	34,256	19,494	76
HUNTER & PARTNERS LIMITED	7,652	10,321	4,996	107
HYDER CONSULTING (UK) LIMITED	87,151	122,901	78,944	56
INTERSERVE (DEFENCE) LTD	158,026	167,843	139,673	20
JACOBS U.K. LIMITED	163,452	236,937	96,910	144
JAMES R. KNOWLES (HOLDINGS) LIMITED	27,775	30,294	22,403	35
KBC PROCESS TECHNOLOGY LIMITED	23,804	20,038	25,777	-22
KEPPIE DESIGN LIMITED	6,742	10,237	4,289	139
LAMBERT SMITH HAMPTON GROUP LIMITED	56,510	70,524	39,732	78
LLEWELYN-DAVIES LIMITED	8,050	8,103	9,286	-13
MERPRO LIMITED	13,844	16,408	8,760	87
MOTT MACDONALD GROUP LIMITED	418,787	626,263	202,306	210
MOTT MACDONALD LIMITED	286,072	440,086	149,488	194
MOUCHEL GROUP PLC	189,813	377,754	57,244	560
MSX INTERNATIONAL LIMITED	56,453	27,032	62,547	-57
NNN LIMITED	10,884	12,500	9,002	39
ON-LINE DESIGN & ENGINEERING LIMITED	14,943	20,515	10,701	92
OVE ARUP & PARTNERS HONG KONG LIMITED	72,605	74,999	66,306	13
PARSONS BRINCKERHOFF LTD	58,452	110,180	28,222	290
PB LTD	69,995	71,075	57,776	23
PELL FRISCHMANN CONSULTANTS LIMITED	15,627	26,838	5,385	398
PELL FRISCHMANN GROUP LTD	26,909	36,830	17,971	105
PENSPEN LIMITED	24,726	30,865	21,776	42
PIPER GROUP PLC	11,267	12,652	9,113	39
PRP ARCHITECTS LIMITED	13,529	21,710	6,564	231
R P S GROUP PLC	146,746	292,449	38,684	656
RIBA ENTERPRISES LTD	13,762	17,125	10,296	66
RICARDO PLC	136,946	168,173	99,655	69
ROGERS STIRK HARBOUR + PARTNERS LIMITED	15,840	19,352	13,921	39
ROUGHTON GROUP LIMITED	9,507	11,094	9,202	21
ROXAR LIMITED	12,080	18,663	10,783	73
RTKL-UK LTD.	9,488	10,901	6,893	58
SCOTT BROWNRIGG LIMITED	8,843	13,188	4,971	165
SCOTT WILSON RAILWAYS LTD	22,985	42,634	10,115	321
SCOTT WILSON SCOTLAND LTD.	9,971	15,948	4,791	233
STILES HAROLD WILLIAMS LIMITED	7,756	9,380	5,282	78
STRIDE TREGLOWN GROUP PLC	8,163	12,610	4,255	196
STRIDE TREGLOWN LIMITED	7,974	12,276	4,154	196
TERENCE O'ROURKE LIMITED	6,571	9,288	4,185	122
THE ENVIRONMENTAL CONSULTANCY LIMITED	47,367	84,298	17,089	393
TPS CONSULT LIMITED	19,332	20,505	16,670	23

URS CORPORATION LIMITED	42,826	65,965	19,406	240
VERITAS DGC LIMITED	72,822	131,087	33,310	294
WATERMAN ASPEN LIMITED	11,640	10,985	14,319	-23
WATERMAN BUILDING SERVICES LIMITED	7,753	9,437	4,638	103
WATERMAN GROUP PLC	56,848	86,765	29,715	192
WATERMAN STRUCTURES LIMITED	20,364	26,356	18,592	42
WHITE YOUNG GREEN PLC	92,692	177,345	37,135	378
WOOD GROUP PRESSURE CONTROL LIMITED	11,291	17,253	4,478	285
WS ATKINS PLC	798,694	1,090,367	436,133	150
WSP CIVILS LIMITED	25,692	36,491	12,741	186
WSP DEVELOPMENT AND TRANSPORTATION LIMITED	18,579	33,615	7,093	374
WSP GROUP PLC	269,814	434,925	105,126	314
WYG ENGINEERING LIMITED	62,011	99,471	35,206	183
WYG ENVIRONMENT PLANNING TRANSPORT LIMITED	13,401	25,826	3,692	599

Appendix 1B: Profit Data

Profit				
Company	10 yr av.	Present	past	%age growth
Name	£ thousand	£ thousand	£ thousand	over 10 years
AMEY OWR LIMITED	1,132	2,206	379	481
ARCADIS AYH PLC	2,364	2,755	1,303	112
ARUP NORTH AMERICA LIMITED	257	-309	558	-155
ASSYSTEM GROUP UK LIMITED	1,137	1,037	1,253	-17
ASSYSTEM UK LIMITED	1,149	884	544	63
AUKETT FITZROY ROBINSON GROUP PLC	417	1,104	1,232	-10
BECHTEL LIMITED	22,927	66,116	12,898	413
BENOY LIMITED	482	625	348	80
BOVIS LEND LEASE PHARMACEUTICAL LIMITED	759	1,216	367	231
BUILDING DESIGN PARTNERSHIP LIMITED	1,396	1,728	1,020	69
BURO HAPPOLD ENGINEERS LIMITED	1,242	2,488	374	565
CAMERON TAYLOR ONE LIMITED	260	32	505	-94
CAPITA SYMONDS LIMITED	10,127	17,307	3,820	353
COLIN BUCHANAN AND PARTNERS LIMITED	845	1,395	567	146
COMMTECH LIMITED	-59	-582	56	-1,145
CORUS RAIL CONSULTANCY LTD	570	-524	884	-159
DET NORSKE VERITAS LIMITED	-108	440	-939	-147
DTZ DEBENHAM TIE LEUNG LIMITED	9,950	11,077	7,214	54
EARTH TECH ENGINEERING LIMITED	1,839	2,457	1,563	57
ELECTROWATT CONSULTANTS LIMITED	690	702	345	103
ENVIRON UK LIMITED	449	522	423	23
EPR ARCHITECTS LIMITED	190	214	198	8
FABER MAUNSELL LIMITED	2,753	9,510	-1,482	-742
FAITHFUL+GOULD LIMITED	2,767	4,819	2,926	65
FORTUM O&M (UK) LIMITED	3,896	555	5,726	-90
FOSTER + PARTNERS LIMITED	2,780	3,292	2,563	28
FRAZER-NASH CONSULTANCY LIMITED	1,276	2,658	369	620
GED SITEC LIMITED	879	2,185	229	854
GOLDER ASSOCIATES (UK) LIMITED	248	480	48	908
HALCROW HOLDINGS LIMITED	4,892	9,286	2,255	312
HASKONING UK LIMITED	614	1,795	183	879
HUNTER & PARTNERS LIMITED	1,021	1,181	846	40
HYDER CONSULTING (UK) LIMITED	1,063	7,337	-2,951	-349
INTERSERVE (DEFENCE) LTD	5,644	10,089	3,102	225
JACOBS U.K. LIMITED	9,398	19,718	3,572	452

JAMES R. KNOWLES (HOLDINGS) LIMITED	397	-1,027	1,200	-186
KBC PROCESS TECHNOLOGY LIMITED	1,580	-1,105	5,153	-121
KEPPIE DESIGN LIMITED	409	480	379	27
LAMBERT SMITH HAMPTON GROUP LIMITED	4,001	5,890	1,947	202
LLEWELYN-DAVIES LIMITED	91,081	-188	79	-338
MERPRO LIMITED	266	623	165	277
MOTT MACDONALD GROUP LIMITED	12,394	20,586	5,345	285
MOTT MACDONALD LIMITED	11,705	26,875	2,460	992
MOUCHEL GROUP PLC	13,034	32,240	2,620	1,131
MSX INTERNATIONAL LIMITED	-757	1,937	-1,451	-234
NNN LIMITED	167	224	167	34
ON-LINE DESIGN & ENGINEERING LIMITED	698	1,156	177	552
OVE ARUP & PARTNERS HONG KONG LIMITED	3,817	3,174	5,712	-44
PARSONS BRINCKERHOFF LTD	1,619	2,276	896	154
PB LTD	-1,031	-49	-2,170	-98
PELL FRISCHMANN CONSULTANTS LIMITED	456	816	176	365
PELL FRISCHMANN GROUP LTD	2,275	3,734	1,962	90
PENSPEN LIMITED	-378	780	660	18
PIPER GROUP PLC	168	72	148	-51
PRP ARCHITECTS LIMITED	256	394	168	134
R P S GROUP PLC	18,228	34,441	6,577	424
RIBA ENTERPRISES LTD	1,342	1,588	853	86
RICARDO PLC	11,016	11,349	10,412	9
ROGERS STIRK HARBOUR + PARTNERS LIMITED	3	2	4	-51
ROUGHTON GROUP LIMITED	201	447	-234	-291
ROXAR LIMITED	440	599	197	204
RTKL-UK LTD.	156	195	631	-69
SCOTT BROWNRIGG LIMITED	1,519	2,271	1,033	120
SCOTT WILSON RAILWAYS LTD	1,573	3,231	292	1,006
SCOTT WILSON SCOTLAND LTD.	672	302	425	-29
STILES HAROLD WILLIAMS LIMITED	643	862	404	113
STRIDE TREGLOWN GROUP PLC	624	1,050	328	220
STRIDE TREGLOWN LIMITED	494	759	265	186
TERENCE O'ROURKE LIMITED	833	906	689	31
THE ENVIRONMENTAL CONSULTANCY LIMITED	7,031	11,711	2,976	294
TPS CONSULT LIMITED	-2,623	-2,904	-2,305	26
URS CORPORATION LIMITED	-342	-417	683	-161
VERITAS DGC LIMITED	3,902	13,201	1,568	742
WATERMAN ASPEN LIMITED	826	1,061	434	144
WATERMAN BUILDING SERVICES LIMITED	676	469	520	-10
WATERMAN GROUP PLC	3,326	4,146	2,458	69

WATERMAN STRUCTURES LIMITED	2,045	1,986	1,797	10
WHITE YOUNG GREEN PLC	5,908	10,858	2,460	341
WOOD GROUP PRESSURE CONTROL LIMITED	466	1,162	179	550
WS ATKINS PLC	24,120	31,767	31,036	2
WSP CIVILS LIMITED	1,228	1,191	167	614
WSP DEVELOPMENT AND TRANSPORTATION LIMITED	2,306	3,433	1,153	198
WSP GROUP PLC	13,058	27,874	6,644	320
WYG ENGINEERING LIMITED	3,323	5,128	2,164	137
WYG ENVIRONMENT PLANNING TRANSPORT LIMITED	1,188	1,868	482	287

Appendix 1C: Capital Employed Data

Capital Employed				
Company	10 yr av.	present	past	%age growth
Name	£ thousand	£ thousand	£ thousand	over 10 years
AMEY OWR LIMITED	12,305.20	19,506.33	7,498.00	160.15
ARCADIS AYH PLC	20,934.60	39,645.33	9,842.33	302.80
ARUP NORTH AMERICA LIMITED	18,772.00	22,142.00	12,854.67	72.25
ASSYSTEM GROUP UK LIMITED	28,351.50	29,297.33	28,581.00	2.51
ASSYSTEM UK LIMITED	25,900.10	33,558.67	17,486.00	91.92
AUKETT FITZROY ROBINSON GROUP PLC	14,903.40	16,847.67	13,013.67	29.46
BECHTEL LIMITED	328,337.90	299,572.00	401,983.00	-25.48
BENOY LIMITED	12,209.10	22,905.00	7,266.00	215.24
BOVIS LEND LEASE PHARMACEUTICAL LIMITED	26,272.60	31,798.33	10,139.67	213.60
BUILDING DESIGN PARTNERSHIP LIMITED	58,710.60	83,800.00	53,031.00	58.02
BURO HAPPOLD ENGINEERS LIMITED	38,565.20	68,565.00	8,670.67	690.77
CAMERON TAYLOR ONE LIMITED	9,878.70	12,556.67	6,880.33	82.50
CAPITA SYMONDS LIMITED	120,575.50	252,997.33	34,382.67	635.83
COLIN BUCHANAN AND PARTNERS LIMITED	9,609.60	11,891.67	6,000.67	98.17
COMMTECH LIMITED	6,720.00	5,764.33	6,521.67	-11.61
CORUS RAIL CONSULTANCY LTD	12,400.20	13,376.67	8,250.67	62.13
DET NORSKE VERITAS LIMITED	16,455.50	23,179.00	13,158.33	76.15
DTZ DEBENHAM TIE LEUNG LIMITED	100,004.50	131,465.67	71,312.00	84.35
EARTH TECH ENGINEERING LIMITED	57,012.20	68,255.67	34,505.00	97.81
ELECTROWATT CONSULTANTS LIMITED	7,272.60	7968	6766	18
ENVIRON UK LIMITED	10,380.00	16722	4617	262
EPR ARCHITECTS LIMITED	7,518.30	8603	5394	59
FABER MAUNSELL LIMITED	79,412.70	142191	22974	519
FAITHFUL+GOULD LIMITED	40,364.90	39690	29014	37
FORTUM O&M (UK) LIMITED	10,743.70	11595	11218	3
FOSTER + PARTNERS LIMITED	51,662.60	67645	39363	72

FRAZER-NASH CONSULTANCY LIMITED	7,831.20	13480	3683	266
GED SITEC LIMITED	7,823.10	15580	3473	349
GOLDER ASSOCIATES (UK) LIMITED	8,113.90	12213	5818	110
HALCROW HOLDINGS LIMITED	176,137.00	244666	129957	88
HASKONING UK LIMITED	21,057.00	27415	19437	41
HUNTER & PARTNERS LIMITED	8,682.90	11815	5758	105
HYDER CONSULTING (UK) LIMITED	94,628.40	97928	108830	-10
INTERSERVE (DEFENCE) LTD	106,170.80	121603	105807	15
JACOBS U.K. LIMITED	100,341.50	141266	61499	130
JAMES R. KNOWLES (HOLDINGS) LIMITED	18,613.30	21549	16030	34
KBC PROCESS TECHNOLOGY LIMITED	28,369.70	29439	27153	8
KEPPIE DESIGN LIMITED	7,921.90	11849	3279	261
LAMBERT SMITH HAMPTON GROUP LIMITED	71,157.70	61643	41480	49
LLEWELYN-DAVIES LIMITED	8,478.40	8990	10601	-15
MERPRO LIMITED	10,885.90	11228	7218	56
MOTT MACDONALD GROUP LIMITED	332,014.00	487880	182842	167
MOTT MACDONALD LIMITED	267,921.90	348434	184735	89
MOUCHEL GROUP PLC	142,989	288,861	40,259	618
MSX INTERNATIONAL LIMITED	61,646.80	39879	79038	-50
NNN LIMITED	6,900.60	7434	6005	24
ON-LINE DESIGN & ENGINEERING LIMITED	6,226.20	8447	4671	81
OVE ARUP & PARTNERS HONG KONG LIMITED	58,036.10	59266	58977	
PARSONS BRINCKERHOFF LTD	77,622.60	126975	51924	145
PB LTD	77,610.50	81795	61880	32
PELL FRISCHMANN CONSULTANTS LIMITED	18,820.30	30268	4999	505
PELL FRISCHMANN GROUP LTD	63,278.40	73660	54668	35
PENSPEN LIMITED	31,192.50	41673	24535	70
PIPER GROUP PLC	5,893	8,400	3,555	136
PRP ARCHITECTS LIMITED	11,363.00	17931	4940	263
R P S GROUP PLC	214,487	375,585	55,962	571
RIBA ENTERPRISES LTD	14,322.70	18209	11030	65
RICARDO PLC	171,143	219,065	115,818	89
ROGERS STIRK HARBOUR + PARTNERS LIMITED	22,438.80	30857	15904	94
ROUGHTON GROUP LIMITED	9,478.40	9199	9534	-4
ROXAR LIMITED	10,684.80	20100	6354	216
RTKL-UK LTD.	9,467.10	9404	7891	19
SCOTT BROWNRIGG LIMITED	11,627.30	16557	6290	163
SCOTT WILSON RAILWAYS LTD	17,104.80	32580	7331	344
SCOTT WILSON SCOTLAND LTD.	12,951.80	25285	6593	284
STILES HAROLD WILLIAMS LIMITED	5,686.90	6894	4396	57
STRIDE TREGLOWN GROUP PLC	5,785	9,002	3,099	190

STRIDE TREGLOWN LIMITED	5,645.90	9178	2888	218
TERENCE O'ROURKE LIMITED	3,645.30	5031	2358	113
THE ENVIRONMENTAL CONSULTANCY LIMITED	61,013.70	97570	19431	402
TPS CONSULT LIMITED	28,611.20	32919	29515	12
URS CORPORATION LIMITED	41,661.70	65860	18317	260
VERITAS DGC LIMITED	152,187.90	243672	78488	210
WATERMAN ASPEN LIMITED	6,755.60	6615	8306	-20
WATERMAN BUILDING SERVICES LIMITED	6,757.40	7196	5632	28
WATERMAN GROUP PLC	66,052	102,257	32,258	217
WATERMAN STRUCTURES LIMITED	28,003.10	34964	25564	37
WHITE YOUNG GREEN PLC	114,686	232,978	35,024	565
WOOD GROUP PRESSURE CONTROL LIMITED	15,361.80	20530	4398	367
WS ATKINS PLC	755,378	1,077,067	452,276	138
WSP CIVILS LIMITED	16,117.50	23156	8696	166
WSP DEVELOPMENT AND TRANSPORTATION LIMITED	17,434.00	28081	8220	242
WSP GROUP PLC	298,336	488,046	101,145	383
WYG ENGINEERING LIMITED	80,635.40	133967	33816	296
WYG ENVIRONMENT PLANNING TRANSPORT LIMITED	11,801.20	22198	2858	677

Appendix 1D: Employee Data

Employees				
Company	10 yr av.	present	past	%age growth
Name	No.	No.	No.	over 10 years
AMEY OWR LIMITED	254	305	212	44
ARCADIS AYH PLC	272	396	177	124
ARUP NORTH AMERICA LIMITED	213	243	157	55
ASSYSTEM GROUP UK LIMITED	612	567	687	-17
ASSYSTEM UK LIMITED	433	520	339	53
AUKETT FITZROY ROBINSON GROUP PLC	212	200	206	-3
BECHTEL LIMITED	1,222	1,111	1,316	-16
BENOY LIMITED	171	247	156	58
BOVIS LEND LEASE PHARMACEUTICAL LIMITED	188	165	152	8
BUILDING DESIGN PARTNERSHIP LIMITED	751	971	667	45
BURO HAPPOLD ENGINEERS LIMITED	613	919	287	220
CAMERON TAYLOR ONE LIMITED	160	203	121	67
CAPITA SYMONDS LIMITED	1,207	2,412	412	486
COLIN BUCHANAN AND PARTNERS LIMITED	264	299	213	40
COMMTECH LIMITED	125	145	90	62
CORUS RAIL CONSULTANCY LTD	245	273	188	45
DET NORSKE VERITAS LIMITED	141	160	146	10
DTZ DEBENHAM TIE LEUNG LIMITED	1,382	1,516	1,151	32
EARTH TECH ENGINEERING LIMITED	384	408	315	29
ELECTROWATT CONSULTANTS LIMITED	194	179	204	-12
ENVIRON UK LIMITED	88	124	59	108
EPR ARCHITECTS LIMITED	117	119	107	12
FABER MAUNSELL LIMITED	1,340	2,322	414	461
FAITHFUL+GOULD LIMITED	1,071	1,118	980	14
FORTUM O&M (UK) LIMITED	104	91	144	-37
FOSTER + PARTNERS LIMITED	532	600	451	33
FRAZER-NASH CONSULTANCY LIMITED	149	230	86	168
GED SITEC LIMITED	193	284	151	88
GOLDER ASSOCIATES (UK) LIMITED	131	198	99	99
HALCROW HOLDINGS LIMITED	3,350	4,323	2,781	55
HASKONING UK LIMITED	423	446	431	3
HUNTER & PARTNERS LIMITED	87	106	69	52
HYDER CONSULTING (UK) LIMITED	1,600	2,128	1,700	25
INTERSERVE (DEFENCE) LTD	811	1,003	672	49

JACOBS U.K. LIMITED	3,122	3,615	2,243	61
JAMES R. KNOWLES (HOLDINGS) LIMITED	350	354	328	8
KBC PROCESS TECHNOLOGY LIMITED	120	118	122	-3.3
KEPPIE DESIGN LIMITED	147	212	102	108
LAMBERT SMITH HAMPTON GROUP LIMITED	765	852	637	34
LLEWELYN-DAVIES LIMITED	147	126	180	-30
MERPRO LIMITED	166	167	153	9
MOTT MACDONALD GROUP LIMITED	6,474	9,814	3,273	200
MOTT MACDONALD LIMITED	3,836	5,530	2,482	123
MOUCHEL GROUP PLC	3,138	6,386	1,060	502
MSX INTERNATIONAL LIMITED	561	320	564	-43
NNN LIMITED	150	139	158	-12
ON-LINE DESIGN & ENGINEERING LIMITED	294	364	135	170
OVE ARUP & PARTNERS HONG KONG LIMITED	1,205	1,612	800	101
PARSONS BRINCKERHOFF LTD	505	586	433	35
PB LTD	1,090	1,113	1,127	-1
PELL FRISCHMANN CONSULTANTS LIMITED	295	485	111	335
PELL FRISCHMANN GROUP LTD	604	760	453	68
PENSPEN LIMITED	249	247	201	23
PIPER GROUP PLC	270	299	183	63
PRP ARCHITECTS LIMITED	223	329	136	142
R P S GROUP PLC	2,086	3,563	789	351
RIBA ENTERPRISES LTD	215	239	188	28
RICARDO PLC	1,463	1,640	1,189	38
ROGERS STIRK HARBOUR + PARTNERS LIMITED	126	140	114	22
ROUGHTON GROUP LIMITED	170	171	174	-2
ROXAR LIMITED	63	84	54	56
RTKL-UK LTD.	83	94	62	52
SCOTT BROWNRIGG LIMITED	112	154	68	127
SCOTT WILSON RAILWAYS LTD	284	442	172	157
SCOTT WILSON SCOTLAND LTD.	159	236	97	142
STILES HAROLD WILLIAMS LIMITED	134	146	106	38
STRIDE TREGLOWN GROUP PLC	139	198	85	133
STRIDE TREGLOWN LIMITED	143	213	85	151
TERENCE O'ROURKE LIMITED	84	112	58	93
THE ENVIRONMENTAL CONSULTANCY LIMITED	689	1,200	276	335
TPS CONSULT LIMITED	279	283	266	6
URS CORPORATION LIMITED	687	860	453	90
VERITAS DGC LIMITED	633	760	516	47
WATERMAN ASPEN LIMITED	232	184	305	-40
WATERMAN BUILDING SERVICES LIMITED	106	109	89	23

WATERMAN GROUP PLC	924	1,185	610	94
WATERMAN STRUCTURES LIMITED	238	212	319	-33
WHITE YOUNG GREEN PLC	1,368	2,182	721	203
WOOD GROUP PRESSURE CONTROL LIMITED	86	95	61	56
WS ATKINS PLC	12,346	13,989	8,487	65
WSP CIVILS LIMITED	401	498	248	101
WSP DEVELOPMENT AND TRANSPORTATION LIMITED	235	387	112	246
WSP GROUP PLC	4,649	6,970	2,092	233
WYG ENGINEERING LIMITED	1,014	1,476	594	149
WYG ENVIRONMENT PLANNING TRANSPORT LIMITED	148	268	46	486

Appendix 1E: Gearing Ratio Data

Gearing Ratio				
Company	10 yr av.	present	past	%age growth
Name	£ thousand	£ thousand	£ thousand	over 10 years
AMEY OWR LIMITED	16	29	8	261
ARCADIS AYH PLC	58	127	19	574
ARUP NORTH AMERICA LIMITED	396	403	396	2
ASSYSTEM GROUP UK LIMITED	125	97	151	-36
ASSYSTEM UK LIMITED	931	405	1,050	-61
AUKETT FITZROY ROBINSON GROUP PLC	113	62	47	32
BECHTEL LIMITED	1,060	70	1,800	-96
BENOY LIMITED	367	63	724	-91
BOVIS LEND LEASE PHARMACEUTICAL LIMITED	77	134	54	149
BUILDING DESIGN PARTNERSHIP LIMITED	459	46	1,361	-97
BURO HAPPOLD ENGINEERS LIMITED	147	79	276	-71
CAMERON TAYLOR ONE LIMITED	140	200	95	109
CAPITA SYMONDS LIMITED	94	242	28	759
COLIN BUCHANAN AND PARTNERS LIMITED	2,485	4,270	1,257	240
COMMTECH LIMITED	447	577	418	38
CORUS RAIL CONSULTANCY LTD	19	52	5	991
DET NORSKE VERITAS LIMITED	434	997	257	287
DTZ DEBENHAM TIE LEUNG LIMITED	83	25	200	-87
EARTH TECH ENGINEERING LIMITED	22	21	12	81
ELECTROWATT CONSULTANTS LIMITED	110	15	291	-95
ENVIRON UK LIMITED	124	122	112	9
EPR ARCHITECTS LIMITED	18	5	24	-79
FABER MAUNSELL LIMITED	333	412	403	2
FAITHFUL+GOULD LIMITED	893	110	714	-85
FORTUM O&M (UK) LIMITED	151	568	48	1,074
FOSTER + PARTNERS LIMITED	38	30	50	-39
FRAZER-NASH CONSULTANCY LIMITED	16	3	28	-88
GED SITEC LIMITED	12	22	7	235
GOLDER ASSOCIATES (UK) LIMITED	133	76	278	-73
HALCROW HOLDINGS LIMITED	42	54	58	-6
HASKONING UK LIMITED	219	495	88	461
HUNTER & PARTNERS LIMITED	48	99	20	384
HYDER CONSULTING (UK) LIMITED	223	49	290	-83
INTERSERVE (DEFENCE) LTD	22	26	23	12

JACOBS U.K. LIMITED	140	299	84	256
JAMES R. KNOWLES (HOLDINGS) LIMITED	77	85	117	-27
KBC PROCESS TECHNOLOGY LIMITED	234	672	104	545
KEPPIE DESIGN LIMITED	131	120	39	206
LAMBERT SMITH HAMPTON GROUP LIMITED	964	136	236	-43
LLEWELYN-DAVIES LIMITED	37	49	21	134
MERPRO LIMITED	268	359	144	149
MOTT MACDONALD GROUP LIMITED	83	170	39	336
MOTT MACDONALD LIMITED	379	394	330	19
MOUCHEL GROUP PLC	16	39	7	483
MSX INTERNATIONAL LIMITED	772	150	301	-50
NNN LIMITED	169	118	219	-46
ON-LINE DESIGN & ENGINEERING LIMITED	68	30	93	-68
OVE ARUP & PARTNERS HONG KONG LIMITED	18	16	3	436
PARSONS BRINCKERHOFF LTD	157	122	330	-63
PB LTD	206	163	316	-48
PELL FRISCHMANN CONSULTANTS LIMITED	243	349	109	220
PELL FRISCHMANN GROUP LTD	15	23	7	218
PENSPEN LIMITED	590	289	1,292	-78
PIPER GROUP PLC	84	93	109	-15
PRP ARCHITECTS LIMITED	114	100	130	-23
R P S GROUP PLC	15	27	8	226
RIBA ENTERPRISES LTD	67	81	65	26
RICARDO PLC	59	100	46	117
ROGERS STIRK HARBOUR + PARTNERS LIMITED	34	3	78	-96
ROUGHTON GROUP LIMITED	407	93	642	-86
ROXAR LIMITED	161	205	235	-13
RTKL-UK LTD.	522	31	459	-93
SCOTT BROWNRIGG LIMITED	17	14	31	-55
SCOTT WILSON RAILWAYS LTD	114	227	55	316
SCOTT WILSON SCOTLAND LTD.	192	351	166	111
STILES HAROLD WILLIAMS LIMITED	27	19	48	-61
STRIDE TREGLOWN GROUP PLC	52	26	83	-68
STRIDE TREGLOWN LIMITED	72	65	95	-32
TERENCE O'ROURKE LIMITED	43	33	33	1
THE ENVIRONMENTAL CONSULTANCY LIMITED	128	100	156	-36
TPS CONSULT LIMITED	288	724	236	207
URS CORPORATION LIMITED	462	344	454	-24
VERITAS DGC LIMITED	587	560	826	-32
WATERMAN ASPEN LIMITED	35	38	57	-33
WATERMAN BUILDING SERVICES LIMITED	78	34	151	-78

WATERMAN GROUP PLC	30	43	7	564
WATERMAN STRUCTURES LIMITED	606	51	1,654	-97
WHITE YOUNG GREEN PLC	50	54	52	4
WOOD GROUP PRESSURE CONTROL LIMITED	502	21	684	-97
WS ATKINS PLC	81	63	47	36
WSP CIVILS LIMITED	220	161	389	-59
WSP DEVELOPMENT AND TRANSPORTATION LIMITED	152	124	189	-34
WSP GROUP PLC	83	106	68	54
WYG ENGINEERING LIMITED	534	753	227	232
WYG ENVIRONMENT PLANNING TRANSPORT LIMITED	76	112	45	149

Appendix 1F: Shareholder's Funds Data

Shareholder's Funds				
Company	**10 yr av.**	**present**	**past**	**%age growth**
Name	**£ thousand**	**£ thousand**	**£ thousand**	**over 10 years**
AMEY OWR LIMITED	4,458	7,346	2,562	187
ARCADIS AYH PLC	5,304	7,918	2,458	222
ARUP NORTH AMERICA LIMITED	-996	-2,112	-1,118	89
ASSYSTEM GROUP UK LIMITED	4,762	7,122	4,130	72
ASSYSTEM UK LIMITED	1,161	3,034	473	541
AUKETT FITZROY ROBINSON GROUP PLC	2,465	3,194	2,629	21
BECHTEL LIMITED	8	25	3	657
BENOY LIMITED	502	864	184	370
BOVIS LEND LEASE PHARMACEUTICAL LIMITED	2,633	3,598	1,065	238
BUILDING DESIGN PARTNERSHIP LIMITED	5,440	9,846	1,283	667
BURO HAPPOLD ENGINEERS LIMITED	4,755	8,387	841	897
CAMERON TAYLOR ONE LIMITED	1,763	1,712	1,634	5
CAPITA SYMONDS LIMITED	31,792	41,499	16,066	158
COLIN BUCHANAN AND PARTNERS LIMITED	31,792	41,499	16,066	158
COMMTECH LIMITED	610	740	425	74
CORUS RAIL CONSULTANCY LTD	4,775	4,979	2,897	72
DET NORSKE VERITAS LIMITED	612	-379	-679	-44
DTZ DEBENHAM TIE LEUNG LIMITED	24,067	31,213	10,012	212
EARTH TECH ENGINEERING LIMITED	16,213	24,218	10,267	136
ELECTROWATT CONSULTANTS LIMITED	2,104,231	3,474,397	566,650	513
ENVIRON UK LIMITED	1,895	3,111	911	241
EPR ARCHITECTS LIMITED	859,637	-726,963	1,300,218	-156
FABER MAUNSELL LIMITED	9,830	16,856	1,713	884
FAITHFUL+GOULD LIMITED	4,066	7,213	3,879	86
FORTUM O&M (UK) LIMITED	3,270	556	2,275	-76
FOSTER + PARTNERS LIMITED	14,806	22,867	5,809	294
FRAZER-NASH CONSULTANCY LIMITED	2,883	5,725	962	495
GED SITEC LIMITED	3,441	5,955	1,741	242
GOLDER ASSOCIATES (UK) LIMITED	1,350	2,077	664	213
HALCROW HOLDINGS LIMITED	22,260	-875	28,850	-103
HASKONING UK LIMITED	3,268	1,848	4,765	-61
HUNTER & PARTNERS LIMITED	1,968	2,387	1,221	95
HYDER CONSULTING (UK) LIMITED	8,583	-941	13,515	-107
INTERSERVE (DEFENCE) LTD	36,230	37,324	37,178	.4

JACOBS U.K. LIMITED	18,160	24,616	10,492	135
JAMES R. KNOWLES (HOLDINGS) LIMITED	4,081	2,789	3,690	-24
KBC PROCESS TECHNOLOGY LIMITED	4,675	252	4,775	-95
KEPPIE DESIGN LIMITED	1,594	2,449	678	261
LAMBERT SMITH HAMPTON GROUP LIMITED	4,164	6,734	3,986	69
LLEWELYN-DAVIES LIMITED	1,183,875	1,198,908	1,146,423	5
MERPRO LIMITED	1,061	835	1,523	-45
MOTT MACDONALD GROUP LIMITED	60,553	60,147	48,591	24
MOTT MACDONALD LIMITED	18,454	25,948	14,116	84
MOUCHEL GROUP PLC	47,286	86,326	14,899	479
MSX INTERNATIONAL LIMITED	6,654	8,266	5,694	45
NNN LIMITED	268	-808	568	-242
ON-LINE DESIGN & ENGINEERING LIMITED	1,278	2,172	661	229
OVE ARUP & PARTNERS HONG KONG LIMITED	12,132	15,580	9,062	72
PARSONS BRINCKERHOFF LTD	18,948	26,051	7,174	263
PB LTD	13,610	17,268	5,073	240
PELL FRISCHMANN CONSULTANTS LIMITED	1,949	2,704	1,211	123
PELL FRISCHMANN GROUP LTD	38,782	41,602	36,634	14
PENSPEN LIMITED	2,962	1,772	1,318	34
PIPER GROUP PLC	1,257	2,189	582	276
PRP ARCHITECTS LIMITED	887	1,451	471	208
R P S GROUP PLC	113,400	192,113	29,787	545
RIBA ENTERPRISES LTD	1,185	950	1,286	-26
RICARDO PLC	48,967	56,500	32,039	76
ROGERS STIRK HARBOUR + PARTNERS LIMITED	2,267	2,857	1,253	128
ROUGHTON GROUP LIMITED	738	1,284	304	322
ROXAR LIMITED	1,630	3,025	282	972
RTKL-UK LTD.	1,219	2,026	812	150
SCOTT BROWNRIGG LIMITED	5,481	7,266	2,468	194
SCOTT WILSON RAILWAYS LTD	2,687	3,428	2,058	67
SCOTT WILSON SCOTLAND LTD.	192	351	166	111
STILES HAROLD WILLIAMS LIMITED	1,755	2,475	1,033	139
STRIDE TREGLOWN GROUP PLC	48,967	56,500	32,039	76
STRIDE TREGLOWN LIMITED	1,312	2,103	579	263
TERENCE O'ROURKE LIMITED	1,051	1,676	631	166
THE ENVIRONMENTAL CONSULTANCY LIMITED	13,416	23,325	3,495	567
TPS CONSULT LIMITED	1,736	33	4,148	-99
URS CORPORATION LIMITED	3,103	3,514	2	210,720
VERITAS DGC LIMITED	20,922	26,300	3,499	652
WATERMAN ASPEN LIMITED	1,809	2,349	1,009	133
WATERMAN BUILDING SERVICES LIMITED	1,875	2,524	910	177

WATERMAN GROUP PLC	21,284	28,894	11,467	152
WATERMAN STRUCTURES LIMITED	2,347	4,034	934	332
WHITE YOUNG GREEN PLC	37,638	72,894	9,416	674
WOOD GROUP PRESSURE CONTROL LIMITED	5,239	10,736	327	3,180
WS ATKINS PLC	60,856	2,000	73,531	-97
WSP CIVILS LIMITED	1,661	2,759	462	497
WSP DEVELOPMENT AND TRANSPORTATION LIMITED	2,808	4,922	1,138	332
WSP GROUP PLC	71,255	100,318	19,811	406
WYG ENGINEERING LIMITED	5,967	8,564	3,809	125
WYG ENVIRONMENT PLANNING TRANSPORT LIMITED	3,002	4,638	887	423

Appendix 1G: Remuneration Data

Remuneration				
Company	10 yr av.	present	past	%age growth
Name	£ thousand	£ thousand	£ thousand	over 10 years
AMEY OWR LIMITED	8,453	12,339	5,425	127
ARCADIS AYH PLC	13,320	21,981	6,898	219
ARUP NORTH AMERICA LIMITED	12,391	14,501	10,029	45
ASSYSTEM GROUP UK LIMITED	20,836	23,996	19,171	25
ASSYSTEM UK LIMITED	14,715	21,719	8,711	149
AUKETT FITZROY ROBINSON GROUP PLC	7,634	6,894	7,440	-7
BECHTEL LIMITED	73,269	80,865	64,578	25
BENOY LIMITED	7,954	14,309	4,666	207
BOVIS LEND LEASE PHARMACEUTICAL LIMITED	8,451	8,911	6,022	48
BUILDING DESIGN PARTNERSHIP LIMITED	30,371	44,996	21,939	105
BURO HAPPOLD ENGINEERS LIMITED	18,408	29,705	10,367	187
CAMERON TAYLOR ONE LIMITED	6,050	9,784	3,176	208
CAPITA SYMONDS LIMITED	38,615	79,800	14,638	445
COLIN BUCHANAN AND PARTNERS LIMITED	8,164	10,386	5,755	80
COMMTECH LIMITED	4,397	5,447	3,212	70
CORUS RAIL CONSULTANCY LTD	7,693	10,116	5,307	91
DET NORSKE VERITAS LIMITED	7,529	9,878	6,177	60
DTZ DEBENHAM TIE LEUNG LIMITED	64,888	87,999	49,623	77
EARTH TECH ENGINEERING LIMITED	13,223	16,104	8,882	81
ELECTROWATT CONSULTANTS LIMITED	2,079	1,842	2,544	-28
ENVIRON UK LIMITED	3,479	5,661	2,114	168
EPR ARCHITECTS LIMITED	4,803	5,175	4,442	17
FABER MAUNSELL LIMITED	49,543	90,041	13,116	587
FAITHFUL+GOULD LIMITED	35,010	46,990	26,622	77
FORTUM O&M (UK) LIMITED	4,330	4,242	5,760	-26
FOSTER + PARTNERS LIMITED	22,183	28,619	17,615	62
FRAZER-NASH CONSULTANCY LIMITED	7,176	13,068	3,580	265
GED SITEC LIMITED	5,290	8,077	3,595	125
GOLDER ASSOCIATES (UK) LIMITED	4,363	7,033	3,034	132
HALCROW HOLDINGS LIMITED	107,995	164,179	70,593	133
HASKONING UK LIMITED	13,733	17,195	12,259	40
HUNTER & PARTNERS LIMITED	3,879	5,653	2,693	110
HYDER CONSULTING (UK) LIMITED	43,739	47,486	45,396	5
INTERSERVE (DEFENCE) LTD	20,271	28,152	15,870	77

JACOBS U.K. LIMITED	93,746	123,648	76,921	61
JAMES R. KNOWLES (HOLDINGS) LIMITED	15,494	17,968	13,610	32
KBC PROCESS TECHNOLOGY LIMITED	7,570	7,681	7,396	4
KEPPIE DESIGN LIMITED	4,604	7,450	3,004	148
LAMBERT SMITH HAMPTON GROUP LIMITED	35,050	45,920	26,425	74
LLEWELYN-DAVIES LIMITED	6,035	5,867	6,185	-5
MERPRO LIMITED	5,179	5,986	4,142	45
MOTT MACDONALD GROUP LIMITED	200,019	322,554	108,315	198
MOTT MACDONALD LIMITED	141,155	226,924	75,093	202
MOUCHEL GROUP PLC	2,380	3,042	1,549	96
MSX INTERNATIONAL LIMITED	19,485	13,821	21,674	-36
NNN LIMITED	5,789	6,233	5,351	16
ON-LINE DESIGN & ENGINEERING LIMITED	7,947	10,751	5,332	102
OVE ARUP & PARTNERS HONG KONG LIMITED	32,076	29,682	33,357	-11
PARSONS BRINCKERHOFF LTD	18,021	25,032	13,196	90
PB LTD	37,063	41,211	31,577	31
PELL FRISCHMANN CONSULTANTS LIMITED	8,694	15,673	2,267	591
PELL FRISCHMANN GROUP LTD	13,762	18,154	10,398	75
PENSPEN LIMITED	10,205	10,679	8,316	28
PIPER GROUP PLC	7,424	9,802	5,007	96
PRP ARCHITECTS LIMITED	9,086	14,728	5,291	178
R P S GROUP PLC	63,713	120,521	25,026	382
RIBA ENTERPRISES LTD	9,086	14,728	5,291	178
RICARDO PLC	62,452	76,661	49,424	55
ROGERS STIRK HARBOUR + PARTNERS LIMITED	6,809	11,155	4,346	157
ROUGHTON GROUP LIMITED	3,928	4,370	4,058	8
ROXAR LIMITED	2,982	4,209	2,284	84
RTKL-UK LTD.	3,993	5,054	3,623	40
SCOTT BROWNRIGG LIMITED	4,831	7,255	3,321	118
SCOTT WILSON RAILWAYS LTD	12,119	25,221	4,630	445
SCOTT WILSON SCOTLAND LTD.	4,944	8,697	2,458	254
STILES HAROLD WILLIAMS LIMITED	5,018	6,192	4,095	51
STRIDE TREGLOWN GROUP PLC	4,428	6,996	2,572	172
STRIDE TREGLOWN LIMITED	4,422	6,996	2,568	172
TERENCE O'ROURKE LIMITED	3,813	5,766	2,509	130
THE ENVIRONMENTAL CONSULTANCY LIMITED	20,657	39,945	6,759	491
TPS CONSULT LIMITED	10,290	11,904	8,775	36
URS CORPORATION LIMITED	22,504	33,245	11,414	191
VERITAS DGC LIMITED	19,534	30,235	15,406	96
WATERMAN ASPEN LIMITED	6,675	6,344	7,895	-20
WATERMAN BUILDING SERVICES LIMITED	4,444	5,231	3,533	48

WATERMAN GROUP PLC	32,182	45,832	21,259	116
WATERMAN STRUCTURES LIMITED	9,049	9,585	10,362	-8
WHITE YOUNG GREEN PLC	43,852	78,276	22,970	241
WOOD GROUP PRESSURE CONTROL LIMITED	3,003	3,869	1,944	99
WS ATKINS PLC	399,836	553,633	265,962	108
WSP CIVILS LIMITED	13,055	18,916	7,896	140
WSP DEVELOPMENT AND TRANSPORTATION LIMITED	8,974	16,447	4,609	257
WSP GROUP PLC	169,327	274,018	92,611	196
WYG ENGINEERING LIMITED	32,988	52,741	23,381	126
WYG ENVIRONMENT PLANNING TRANSPORT LIMITED	5,275	10,320	1,801	473

Appendix 2: UK SIC (2003) codes used in selection

2003 SIC:

74.15/3 Management activities of construction holding companies

74.20/1 Architectural activities

74.20/2 Urban planning and landscape architectural activities

74.20/3 Quantity surveying activities

74.20/4 Engineering consultative and design activities

74.20/6 Engineering related scientific and technical consulting activities

74.20/9 Other engineering activities

Appendix 3: Key Business Ratios

Profitability Ratio: Profit/Turnover (profit margin)

	Profitability Ratio		
Company name:	Profit/Turnover (profit margin)		
	10 yr average	present 3yr av.	past 3yr av.
PENSPEN LIMITED	-0.015	0.03	0.03
PB LTD	-0.015	0.00	-0.04
MSX INTERNATIONAL LIMITED	-0.013	0.07	-0.02
URS CORPORATION LIMITED	-0.008	-0.01	0.04
DET NORSKE VERITAS LIMITED	-0.006	0.02	-0.05
COMMTECH LIMITED	-0.006	-0.05	0.01
ROGERS STIRK HARBOUR + PARTNERS LIMITED	0.000	0.00	0.00
DESURVEY PLC	0.003	0.00	0.01
HYDER CONSULTING (UK) LIMITED	0.012	0.06	-0.04
ARUP NORTH AMERICA LIMITED	0.012	-0.01	0.04
JAMES R. KNOWLES (HOLDINGS) LIMITED	0.014	-0.03	0.05
PIPER GROUP PLC	0.015	0.01	0.02
NNN LIMITED	0.015	0.02	0.02
RTKL-UK LTD.	0.016	0.02	0.09
WSP UK LIMITED	0.017	0.02	0.08
ASSYSTEM GROUP UK LIMITED	0.019	0.01	0.03
PRP ARCHITECTS LIMITED	0.019	0.02	0.03
MERPRO LIMITED	0.019	0.04	0.02
TPS CONSULT LIMITED	0.020	-0.14	-0.14
BOVIS LEND LEASE PHARMACEUTICAL LIMITED	0.021	0.02	0.02
ROUGHTON GROUP LIMITED	0.021	0.04	-0.03
JACOBS ENGINEERING U.K. LIMITED	0.022	0.03	0.04
ASSYSTEM UK LIMITED	0.023	0.01	0.02
CAMERON TAYLOR ONE LIMITED	0.024	0.00	0.07
GOLDER ASSOCIATES (UK) LIMITED	0.024	0.03	0.01
EARTH TECH ENGINEERING LIMITED	0.025	0.03	0.04
HASKONING UK LIMITED	0.025	0.05	0.01
HALCROW HOLDINGS LIMITED	0.025	0.03	0.02

EPR ARCHITECTS LIMITED	0.025	0.02	0.03
BUILDING DESIGN PARTNERSHIP LIMITED	0.026	0.02	0.03
PARSONS BRINCKERHOFF LTD	0.028	0.02	0.03
AUKETT FITZROY ROBINSON GROUP PLC	0.028	0.07	0.09
PELL FRISCHMANN CONSULTANTS LIMITED	0.029	0.03	0.03
MOTT MACDONALD GROUP LIMITED	0.030	0.03	0.03
FORTUM O&M (UK) LIMITED	0.030	0.05	0.38
LLEWELYN-DAVIES LIMITED	0.030	-0.02	0.01
WS ATKINS PLC	0.030	0.03	0.07
ARUP GROUP LIMITED	0.030	0.04	0.01
BURO HAPPOLD ENGINEERS LIMITED	0.031	0.04	0.02
HYDER CONSULTING PLC	0.032	0.05	-0.04
FABER MAUNSELL LIMITED	0.032	0.06	-0.06
INTERSERVE (DEFENCE) LTD	0.036	0.06	0.02
ROXAR LIMITED	0.036	0.03	0.02
CORUS RAIL CONSULTANCY LTD	0.037	-0.03	0.11
BENOY LIMITED	0.040	0.03	0.04
MOTT MACDONALD LIMITED	0.041	0.06	0.02
WOOD GROUP PRESSURE CONTROL LIMITED	0.041	0.07	0.04
FAITHFUL+GOULD LIMITED	0.042	0.05	0.07
ON-LINE DESIGN & ENGINEERING LIMITED	0.047	0.06	0.02
WSP CIVILS LIMITED	0.048	0.03	0.01
WSP GROUP PLC	0.048	0.06	0.06
MWH UK LIMITED	0.049	0.07	0.00
ENVIRON UK LIMITED	0.050	0.04	0.08
OVE ARUP & PARTNERS HONG KONG LIMITED	0.053	0.04	0.09
GRONTMIJ GROUP LIMITED	0.053	0.07	0.00
WYG ENGINEERING LIMITED	0.054	0.05	0.06
VERITAS DGC LIMITED	0.054	0.10	0.05
GED SITEC LIMITED	0.055	0.07	0.03
OVE ARUP & PARTNERS INTERNATIONAL LIMITED	0.056	0.06	0.05
JACOBS U.K. LIMITED	0.057	0.08	0.04
WATERMAN GROUP PLC	0.058	0.05	0.08
COLIN BUCHANAN AND PARTNERS LIMITED	0.059	0.08	0.06
KEPPIE DESIGN LIMITED	0.061	0.05	0.09
STRIDE TREGLOWN LIMITED	0.062	0.06	0.06
AMEY OWR LIMITED	0.063	0.08	0.04

WHITE YOUNG GREEN PLC	0.064	0.06	0.07
KBC PROCESS TECHNOLOGY LIMITED	0.066	-0.06	0.20
SCOTT WILSON SCOTLAND LTD.	0.067	0.02	0.09
SCOTT WILSON RAILWAYS LTD	0.068	0.08	0.03
MOUCHEL GROUP PLC	0.069	0.09	0.05
LAMBERT SMITH HAMPTON GROUP LIMITED	0.071	0.08	0.05
WATERMAN ASPEN LIMITED	0.071	0.10	0.03
BECHTEL LIMITED	0.072	0.25	0.03
STRIDE TREGLOWN GROUP PLC	0.076	0.08	0.08
FOSTER + PARTNERS LIMITED	0.079	0.07	0.09
RICARDO PLC	0.080	0.07	0.10
STILES HAROLD WILLIAMS LIMITED	0.083	0.09	0.08
PELL FRISCHMANN GROUP LTD	0.085	0.10	0.11
WATERMAN BUILDING SERVICES LIMITED	0.087	0.05	0.11
MOUCHEL LIMITED	0.088	0.10	0.04
WYG ENVIRONMENT PLANNING TRANSPORT LIMITED	0.089	0.07	0.13
DTZ DEBENHAM TIE LEUNG LIMITED	0.091	0.08	0.09
RIBA ENTERPRISES LTD	0.097	0.09	0.08
ARCADIS AYH PLC	0.099	0.07	0.10
WATERMAN STRUCTURES LIMITED	0.100	0.08	0.10
FRAZER-NASH CONSULTANCY LIMITED	0.100	0.12	0.07
WSP DEVELOPMENT AND TRANSPORTATION LIMITED	0.124	0.10	0.16
R P S GROUP PLC	0.124	0.12	0.17
TERENCE O'ROURKE LIMITED	0.127	0.10	0.16
ELECTROWATT CONSULTANTS LIMITED	0.132	0.14	0.08
HUNTER & PARTNERS LIMITED	0.133	0.11	0.17
CAPITA SYMONDS LIMITED	0.141	0.12	0.16
THE ENVIRONMENTAL CONSULTANCY LIMITED	0.148	0.14	0.17
SCOTT BROWNRIGG LIMITED	0.172	0.17	0.21

Profitability Ratio: Profit / Capital Employed

	Profitability Ratio		
Company name:	Profit / Capital Employed		
	10 yr average	present 3yr av.	past 3yr av.
TPS CONSULT LIMITED	-0.09	-0.09	-0.08
PB LTD	-0.01	0.00	-0.04
MSX INTERNATIONAL LIMITED	-0.01	0.05	-0.02
PENSPEN LIMITED	-0.01	0.02	0.03
COMMTECH LIMITED	-0.01	-0.10	0.01
URS CORPORATION LIMITED	-0.01	-0.01	0.04
DET NORSKE VERITAS LIMITED	-0.01	0.02	-0.07
ROGERS STIRK HARBOUR + PARTNERS LIMITED	0.00	0.00	0.00
DESURVEY PLC	0.01	0.00	0.02
HYDER CONSULTING (UK) LIMITED	0.01	0.07	-0.03
ARUP NORTH AMERICA LIMITED	0.01	-0.01	0.04
RTKL-UK LTD.	0.02	0.02	0.08
WSP UK LIMITED	0.02	0.02	0.08
PARSONS BRINCKERHOFF LTD	0.02	0.02	0.02
ROUGHTON GROUP LIMITED	0.02	0.05	-0.02
JAMES R. KNOWLES (HOLDINGS) LIMITED	0.02	-0.05	0.07
PRP ARCHITECTS LIMITED	0.02	0.02	0.03
JACOBS ENGINEERING U.K. LIMITED	0.02	0.03	0.05
BUILDING DESIGN PARTNERSHIP LIMITED	0.02	0.02	0.02
NNN LIMITED	0.02	0.03	0.03
PELL FRISCHMANN CONSULTANTS LIMITED	0.02	0.03	0.04
MERPRO LIMITED	0.02	0.06	0.02
EPR ARCHITECTS LIMITED	0.03	0.02	0.04
VERITAS DGC LIMITED	0.03	0.05	0.02
CAMERON TAYLOR ONE LIMITED	0.03	0.00	0.07
HALCROW HOLDINGS LIMITED	0.03	0.04	0.02
AUKETT FITZROY ROBINSON GROUP PLC	0.03	0.07	0.09
PIPER GROUP PLC	0.03	0.01	0.04
BOVIS LEND LEASE PHARMACEUTICAL LIMITED	0.03	0.04	0.04
HASKONING UK LIMITED	0.03	0.07	0.01
WOOD GROUP PRESSURE CONTROL LIMITED	0.03	0.06	0.04

GOLDER ASSOCIATES (UK) LIMITED	0.03	0.04	0.01
HYDER CONSULTING PLC	0.03	0.05	-0.06
WS ATKINS PLC	0.03	0.03	0.07
BURO HAPPOLD ENGINEERS LIMITED	0.03	0.04	0.04
EARTH TECH ENGINEERING LIMITED	0.03	0.04	0.05
FABER MAUNSELL LIMITED	0.03	0.07	-0.06
PELL FRISCHMANN GROUP LTD	0.04	0.05	0.04
ARUP GROUP LIMITED	0.04	0.05	0.02
MOTT MACDONALD GROUP LIMITED	0.04	0.04	0.03
BENOY LIMITED	0.04	0.03	0.05
ASSYSTEM GROUP UK LIMITED	0.04	0.04	0.04
ROXAR LIMITED	0.04	0.03	0.03
WYG ENGINEERING LIMITED	0.04	0.04	0.06
ENVIRON UK LIMITED	0.04	0.03	0.09
MOTT MACDONALD LIMITED	0.04	0.08	0.01
WSP GROUP PLC	0.04	0.06	0.07
ASSYSTEM UK LIMITED	0.04	0.03	0.03
CORUS RAIL CONSULTANCY LTD	0.05	-0.04	0.11
WATERMAN GROUP PLC	0.05	0.04	0.08
WHITE YOUNG GREEN PLC	0.05	0.05	0.07
KEPPIE DESIGN LIMITED	0.05	0.04	0.12
SCOTT WILSON SCOTLAND LTD.	0.05	0.01	0.06
INTERSERVE (DEFENCE) LTD	0.05	0.08	0.03
FOSTER + PARTNERS LIMITED	0.05	0.05	0.07
KBC PROCESS TECHNOLOGY LIMITED	0.06	-0.04	0.19
LAMBERT SMITH HAMPTON GROUP LIMITED	0.06	0.10	0.05
RICARDO PLC	0.06	0.05	0.09
OVE ARUP & PARTNERS HONG KONG LIMITED	0.07	0.05	0.10
FAITHFUL+GOULD LIMITED	0.07	0.12	0.10
GRONTMIJ GROUP LIMITED	0.07	0.11	0.00
OVE ARUP & PARTNERS INTERNATIONAL LIMITED	0.07	0.06	0.12
BECHTEL LIMITED	0.07	0.22	0.03
MWH UK LIMITED	0.07	0.10	0.00
WATERMAN STRUCTURES LIMITED	0.07	0.06	0.07
WSP CIVILS LIMITED	0.08	0.05	0.02
CAPITA SYMONDS LIMITED	0.08	0.07	0.11
R P S GROUP PLC	0.08	0.09	0.12

STRIDE TREGLOWN LIMITED	0.09	0.08	0.09
COLIN BUCHANAN AND PARTNERS LIMITED	0.09	0.12	0.09
MOUCHEL LIMITED	0.09	0.11	0.07
MOUCHEL GROUP PLC	0.09	0.11	0.07
SCOTT WILSON RAILWAYS LTD	0.09	0.10	0.04
AMEY OWR LIMITED	0.09	0.11	0.05
JACOBS U.K. LIMITED	0.09	0.14	0.06
RIBA ENTERPRISES LTD	0.09	0.09	0.08
ELECTROWATT CONSULTANTS LIMITED	0.09	0.09	0.05
DTZ DEBENHAM TIE LEUNG LIMITED	0.10	0.08	0.10
WATERMAN BUILDING SERVICES LIMITED	0.10	0.07	0.09
WYG ENVIRONMENT PLANNING TRANSPORT LIMITED	0.10	0.08	0.17
STRIDE TREGLOWN GROUP PLC	0.11	0.12	0.11
ON-LINE DESIGN & ENGINEERING LIMITED	0.11	0.14	0.04
GED SITEC LIMITED	0.11	0.14	0.07
ARCADIS AYH PLC	0.11	0.07	0.13
STILES HAROLD WILLIAMS LIMITED	0.11	0.13	0.09
THE ENVIRONMENTAL CONSULTANCY LIMITED	0.12	0.12	0.15
HUNTER & PARTNERS LIMITED	0.12	0.10	0.15
WATERMAN ASPEN LIMITED	0.12	0.16	0.05
SCOTT BROWNRIGG LIMITED	0.13	0.14	0.16
WSP DEVELOPMENT AND TRANSPORTATION LIMITED	0.13	0.12	0.14
FRAZER-NASH CONSULTANCY LIMITED	0.16	0.20	0.10
TERENCE O'ROURKE LIMITED	0.23	0.18	0.29
FORTUM O&M (UK) LIMITED	0.36	0.05	0.51
LLEWELYN-DAVIES LIMITED	10.74	-0.02	0.01

Capital Ratio: Turnover / Capital Employed (Asset Turnover)

	Capital Ratio		
Company name:	Turnover / Capital Employed (asset turnover)		
	10 yr average	present 3yr av.	past 3yr av.
PELL FRISCHMANN GROUP LTD	0.43	0.50	0.33
VERITAS DGC LIMITED	0.48	0.54	0.42
CAPITA SYMONDS LIMITED	0.60	0.56	0.71
TPS CONSULT LIMITED	0.68	0.62	0.56
R P S GROUP PLC	0.68	0.78	0.69
FOSTER + PARTNERS LIMITED	0.69	0.65	0.70
ROGERS STIRK HARBOUR + PARTNERS LIMITED	0.71	0.63	0.88
ELECTROWATT CONSULTANTS LIMITED	0.72	0.62	0.66
WATERMAN STRUCTURES LIMITED	0.73	0.75	0.73
WOOD GROUP PRESSURE CONTROL LIMITED	0.74	0.84	1.02
PARSONS BRINCKERHOFF LTD	0.75	0.87	0.54
SCOTT BROWNRIGG LIMITED	0.76	0.80	0.79
WYG ENGINEERING LIMITED	0.77	0.74	1.04
SCOTT WILSON SCOTLAND LTD.	0.77	0.63	0.73
THE ENVIRONMENTAL CONSULTANCY LIMITED	0.78	0.86	0.88
PENSPEN LIMITED	0.79	0.74	0.89
LAMBERT SMITH HAMPTON GROUP LIMITED	0.79	1.14	0.96
RICARDO PLC	0.80	0.77	0.86
WHITE YOUNG GREEN PLC	0.81	0.76	1.06
PELL FRISCHMANN CONSULTANTS LIMITED	0.83	0.89	1.08
KBC PROCESS TECHNOLOGY LIMITED	0.84	0.68	0.95
KEPPIE DESIGN LIMITED	0.85	0.86	1.31
ENVIRON UK LIMITED	0.86	0.81	1.14
WATERMAN GROUP PLC	0.86	0.85	0.92
HUNTER & PARTNERS LIMITED	0.88	0.87	0.87
PB LTD	0.90	0.87	0.93
WSP GROUP PLC	0.90	0.89	1.04
MSX INTERNATIONAL LIMITED	0.92	0.68	0.79
BUILDING DESIGN PARTNERSHIP LIMITED	0.92	0.92	0.77
HYDER CONSULTING (UK) LIMITED	0.92	1.26	0.73
LLEWELYN-DAVIES LIMITED	0.95	0.90	0.88

RIBA ENTERPRISES LTD	0.96	0.94	0.93
WSP UK LIMITED	0.97	1.07	1.04
BECHTEL LIMITED	0.97	0.87	1.07
BENOY LIMITED	0.99	0.91	1.10
AUKETT FITZROY ROBINSON GROUP PLC	0.99	0.96	1.04
EPR ARCHITECTS LIMITED	1.00	1.04	1.08
RTKL-UK LTD.	1.00	1.16	0.87
ROUGHTON GROUP LIMITED	1.00	1.21	0.97
HYDER CONSULTING PLC	1.01	1.06	1.42
URS CORPORATION LIMITED	1.03	1.00	1.06
MOUCHEL LIMITED	1.03	1.05	1.58
BURO HAPPOLD ENGINEERS LIMITED	1.04	0.95	2.05
WS ATKINS PLC	1.06	1.01	0.96
WSP DEVELOPMENT AND TRANSPORTATION LIMITED	1.07	1.20	0.86
MOTT MACDONALD LIMITED	1.07	1.26	0.81
FABER MAUNSELL LIMITED	1.07	1.10	1.00
FORTUM O&M (UK) LIMITED	1.08	0.99	1.33
JACOBS ENGINEERING U.K. LIMITED	1.09	1.09	1.31
DET NORSKE VERITAS LIMITED	1.09	0.81	1.46
DTZ DEBENHAM TIE LEUNG LIMITED	1.10	1.07	1.08
CAMERON TAYLOR ONE LIMITED	1.10	1.16	1.11
HALCROW HOLDINGS LIMITED	1.11	1.16	0.97
ARUP NORTH AMERICA LIMITED	1.11	1.09	1.08
ROXAR LIMITED	1.13	0.93	1.70
WYG ENVIRONMENT PLANNING TRANSPORT LIMITED	1.14	1.16	1.29
ARCADIS AYH PLC	1.14	0.96	1.33
WATERMAN BUILDING SERVICES LIMITED	1.15	1.31	0.82
HASKONING UK LIMITED	1.18	1.25	1.00
PRP ARCHITECTS LIMITED	1.19	1.21	1.33
ARUP GROUP LIMITED	1.20	1.21	1.04
OVE ARUP & PARTNERS INTERNATIONAL LIMITED	1.25	1.08	2.21
GOLDER ASSOCIATES (UK) LIMITED	1.25	1.35	1.21
OVE ARUP & PARTNERS HONG KONG LIMITED	1.25	1.27	1.12
CORUS RAIL CONSULTANCY LTD	1.25	1.31	0.99
MOTT MACDONALD GROUP LIMITED	1.26	1.28	1.11
MERPRO LIMITED	1.27	1.46	1.21
GRONTMIJ GROUP LIMITED	1.29	1.67	1.13

EARTH TECH ENGINEERING LIMITED	1.30	1.25	1.13
MOUCHEL GROUP PLC	1.33	1.31	1.42
SCOTT WILSON RAILWAYS LTD	1.34	1.31	1.38
STILES HAROLD WILLIAMS LIMITED	1.36	1.36	1.20
BOVIS LEND LEASE PHARMACEUTICAL LIMITED	1.40	1.61	1.60
STRIDE TREGLOWN GROUP PLC	1.41	1.40	1.37
STRIDE TREGLOWN LIMITED	1.41	1.34	1.44
AMEY OWR LIMITED	1.45	1.39	1.39
MWH UK LIMITED	1.46	1.55	1.14
INTERSERVE (DEFENCE) LTD	1.49	1.38	1.32
COLIN BUCHANAN AND PARTNERS LIMITED	1.49	1.55	1.48
JAMES R. KNOWLES (HOLDINGS) LIMITED	1.49	1.41	1.40
NNN LIMITED	1.58	1.68	1.50
COMMTECH LIMITED	1.59	2.01	1.37
WSP CIVILS LIMITED	1.59	1.58	1.47
FRAZER-NASH CONSULTANCY LIMITED	1.62	1.71	1.48
FAITHFUL+GOULD LIMITED	1.63	2.22	1.46
JACOBS U.K. LIMITED	1.63	1.68	1.58
WATERMAN ASPEN LIMITED	1.72	1.66	1.72
TERENCE O'ROURKE LIMITED	1.80	1.85	1.77
PIPER GROUP PLC	1.91	1.51	2.56
ASSYSTEM UK LIMITED	1.96	2.43	1.45
GED SITEC LIMITED	2.04	2.01	2.32
ASSYSTEM GROUP UK LIMITED	2.13	2.80	1.57
ON-LINE DESIGN & ENGINEERING LIMITED	2.40	2.43	2.29
DESURVEY PLC	2.42	2.20	2.71

Labour Productivity Ratio: Turnover / Employees

	Productivity		
Company name:	Turnover / Employees		
	10 yr average (£th/emp)	present 3yr av. (£th/emp)	past 3yr av. (£th/emp)
ELECTROWATT CONSULTANTS LIMITED	26.90	27.75	21.78
PIPER GROUP PLC	41.79	42.36	49.71
PELL FRISCHMANN GROUP LTD	44.59	48.44	39.67
KEPPIE DESIGN LIMITED	45.99	48.21	42.05
WATERMAN ASPEN LIMITED	50.17	59.70	47.00
ON-LINE DESIGN & ENGINEERING LIMITED	50.86	56.31	79.26
JACOBS U.K. LIMITED	52.36	65.54	43.21
PELL FRISCHMANN CONSULTANTS LIMITED	53.01	55.37	48.37
COLIN BUCHANAN AND PARTNERS LIMITED	54.35	61.59	41.65
HYDER CONSULTING (UK) LIMITED	54.47	57.76	46.45
LLEWELYN-DAVIES LIMITED	54.61	64.14	51.49
GRONTMIJ GROUP LIMITED	55.04	63.75	45.24
STRIDE TREGLOWN LIMITED	55.65	57.73	49.06
ROUGHTON GROUP LIMITED	55.89	65.01	52.79
HYDER CONSULTING PLC	56.62	51.74	218.38
DESURVEY PLC	57.67	62.94	64.52
STILES HAROLD WILLIAMS LIMITED	57.93	64.24	49.99
WSP GROUP PLC	58.03	62.40	50.25
HALCROW HOLDINGS LIMITED	58.17	65.92	45.47
HASKONING UK LIMITED	58.66	76.81	45.23
STRIDE TREGLOWN GROUP PLC	58.81	63.79	50.26
CAPITA SYMONDS LIMITED	59.74	58.36	59.29
OVE ARUP & PARTNERS HONG KONG LIMITED	60.26	46.53	82.85
MOUCHEL GROUP PLC	60.49	59.15	53.99
PRP ARCHITECTS LIMITED	60.80	65.92	48.26
WYG ENGINEERING LIMITED	61.14	67.39	59.30
FAITHFUL+GOULD LIMITED	61.30	78.64	43.19
WATERMAN GROUP PLC	61.50	73.20	48.69
MOUCHEL LIMITED	61.54	64.07	57.71
URS CORPORATION LIMITED	62.37	76.70	42.84

SCOTT WILSON SCOTLAND LTD.	62.91	67.67	49.22
FABER MAUNSELL LIMITED	63.28	67.44	55.46
CORUS RAIL CONSULTANCY LTD	63.40	64.46	43.70
RIBA ENTERPRISES LTD	64.01	71.55	54.86
WSP CIVILS LIMITED	64.15	73.28	51.31
PB LTD	64.19	63.86	51.27
EPR ARCHITECTS LIMITED	64.43	75.12	54.76
MOTT MACDONALD GROUP LIMITED	64.69	63.81	61.82
WS ATKINS PLC	64.69	77.95	51.39
ARUP GROUP LIMITED	65.31	71.23	58.36
BURO HAPPOLD ENGINEERS LIMITED	65.71	71.08	62.15
FOSTER + PARTNERS LIMITED	66.53	73.56	60.88
WHITE YOUNG GREEN PLC	67.76	81.26	51.50
CAMERON TAYLOR ONE LIMITED	67.84	71.77	62.96
THE ENVIRONMENTAL CONSULTANCY LIMITED	68.71	70.25	61.92
TPS CONSULT LIMITED	69.26	72.46	62.59
AUKETT FITZROY ROBINSON GROUP PLC	69.79	80.39	65.86
R P S GROUP PLC	70.35	82.08	49.01
AMEY OWR LIMITED	70.57	89.03	49.28
BENOY LIMITED	70.63	84.85	51.13
WSP UK LIMITED	71.34	79.40	56.74
BUILDING DESIGN PARTNERSHIP LIMITED	71.94	79.44	61.01
MWH UK LIMITED	72.60	80.06	56.78
NNN LIMITED	72.70	89.93	57.10
WATERMAN BUILDING SERVICES LIMITED	73.28	86.58	52.30
LAMBERT SMITH HAMPTON GROUP LIMITED	73.83	82.74	62.34
MOTT MACDONALD LIMITED	74.58	79.58	60.24
GOLDER ASSOCIATES (UK) LIMITED	77.72	83.13	70.77
TERENCE O'ROURKE LIMITED	78.51	82.69	71.74
SCOTT BROWNRIGG LIMITED	79.03	85.82	73.46
WSP DEVELOPMENT AND TRANSPORTATION LIMITED	79.09	86.94	63.52
JAMES R. KNOWLES (HOLDINGS) LIMITED	79.27	85.58	68.30
DTZ DEBENHAM TIE LEUNG LIMITED	79.39	93.20	66.79
SCOTT WILSON RAILWAYS LTD	80.82	96.53	58.81
GED SITEC LIMITED	82.76	110.17	53.25
MERPRO LIMITED	83.50	98.45	57.25
FRAZER-NASH CONSULTANCY LIMITED	85.07	100.16	63.52

COMMTECH LIMITED	85.49	79.55	99.96
WATERMAN STRUCTURES LIMITED	85.67	124.32	58.34
ARCADIS AYH PLC	87.93	95.86	73.95
HUNTER & PARTNERS LIMITED	88.25	97.68	72.06
WYG ENVIRONMENT PLANNING TRANSPORT LIMITED	90.43	96.49	80.85
RICARDO PLC	93.59	102.52	83.79
OVE ARUP & PARTNERS INTERNATIONAL LIMITED	93.70	85.33	442.51
ARUP NORTH AMERICA LIMITED	98.01	98.89	88.79
ASSYSTEM GROUP UK LIMITED	98.69	144.86	65.48
PENSPEN LIMITED	99.14	124.96	108.52
MSX INTERNATIONAL LIMITED	100.65	84.56	110.97
ENVIRON UK LIMITED	100.77	109.12	88.80
FORTUM O&M (UK) LIMITED	111.22	125.93	103.10
RTKL-UK LTD.	113.77	115.96	111.17
VERITAS DGC LIMITED	115.06	172.41	64.51
PARSONS BRINCKERHOFF LTD	115.72	187.91	65.13
ASSYSTEM UK LIMITED	117.30	156.68	74.87
ROGERS STIRK HARBOUR + PARTNERS LIMITED	125.61	138.23	121.76
DET NORSKE VERITAS LIMITED	127.54	117.49	132.01
WOOD GROUP PRESSURE CONTROL LIMITED	130.84	182.25	73.81
JACOBS ENGINEERING U.K. LIMITED	141.55	128.08	180.26
ROXAR LIMITED	193.28	223.07	200.92
EARTH TECH ENGINEERING LIMITED	193.82	209.48	124.04
INTERSERVE (DEFENCE) LTD	194.78	167.29	207.74
BOVIS LEND LEASE PHARMACEUTICAL LIMITED	195.04	311.67	106.57
KBC PROCESS TECHNOLOGY LIMITED	198.03	170.29	211.87
BECHTEL LIMITED	260.96	234.21	327.19

Labour Productivity Ratio: Profit / Employees

Company name:	Productivity Profit / Employees 10 yr average (£th/emp)	present 3yr av. (£th/emp)	past 3yr av. (£th/emp)
TPS CONSULT LIMITED	-9.40	-10.26	-8.66
PENSPEN LIMITED	-1.52	3.16	3.29
MSX INTERNATIONAL LIMITED	-1.35	6.06	-2.57
PB LTD	-0.95	-0.04	-1.93
DET NORSKE VERITAS LIMITED	-0.76	2.75	-6.43
URS CORPORATION LIMITED	-0.50	-0.48	1.51
COMMTECH LIMITED	-0.47	-4.00	0.62
ROGERS STIRK HARBOUR + PARTNERS LIMITED	0.02	0.01	0.03
DESURVEY PLC	0.15	-0.09	0.47
PIPER GROUP PLC	0.62	0.24	0.81
HYDER CONSULTING (UK) LIMITED	0.66	3.45	-1.74
NNN LIMITED	1.11	1.61	1.06
JAMES R. KNOWLES (HOLDINGS) LIMITED	1.13	-2.90	3.66
PRP ARCHITECTS LIMITED	1.15	1.20	1.24
ROUGHTON GROUP LIMITED	1.18	2.62	-1.34
ARUP NORTH AMERICA LIMITED	1.21	-1.27	3.55
WSP UK LIMITED	1.24	1.54	4.61
HASKONING UK LIMITED	1.45	4.02	0.43
HALCROW HOLDINGS LIMITED	1.46	2.15	0.81
PELL FRISCHMANN CONSULTANTS LIMITED	1.55	1.68	1.58
MERPRO LIMITED	1.60	3.74	1.08
EPR ARCHITECTS LIMITED	1.63	1.80	1.85
CAMERON TAYLOR ONE LIMITED	1.63	0.16	4.17
HYDER CONSULTING PLC	1.79	2.64	-8.70
ASSYSTEM GROUP UK LIMITED	1.86	1.83	1.82
BUILDING DESIGN PARTNERSHIP LIMITED	1.86	1.78	1.53
RTKL-UK LTD.	1.87	2.08	10.17
GOLDER ASSOCIATES (UK) LIMITED	1.90	2.43	0.48
MOTT MACDONALD GROUP LIMITED	1.91	2.10	1.63
WS ATKINS PLC	1.95	2.27	3.66
AUKETT FITZROY ROBINSON GROUP PLC	1.97	5.51	5.97

ARUP GROUP LIMITED	1.99	3.06	0.87
BURO HAPPOLD ENGINEERS LIMITED	2.03	2.71	1.31
FABER MAUNSELL LIMITED	2.05	4.10	-3.58
CORUS RAIL CONSULTANCY LTD	2.33	-1.92	4.71
ON-LINE DESIGN & ENGINEERING LIMITED	2.38	3.17	1.31
FAITHFUL+GOULD LIMITED	2.58	4.31	2.99
ASSYSTEM UK LIMITED	2.66	1.70	1.60
KEPPIE DESIGN LIMITED	2.79	2.26	3.71
WSP GROUP PLC	2.81	4.00	3.18
BENOY LIMITED	2.82	2.54	2.23
GRONTMIJ GROUP LIMITED	2.93	4.37	-0.10
JACOBS U.K. LIMITED	3.01	5.45	1.59
MOTT MACDONALD LIMITED	3.05	4.86	0.99
WSP CIVILS LIMITED	3.07	2.39	0.67
JACOBS ENGINEERING U.K. LIMITED	3.10	3.91	6.81
OVE ARUP & PARTNERS HONG KONG LIMITED	3.17	1.97	7.14
COLIN BUCHANAN AND PARTNERS LIMITED	3.20	4.67	2.66
PARSONS BRINCKERHOFF LTD	3.20	3.88	2.07
WYG ENGINEERING LIMITED	3.28	3.47	3.65
STRIDE TREGLOWN LIMITED	3.45	3.57	3.13
WATERMAN ASPEN LIMITED	3.56	5.76	1.42
ELECTROWATT CONSULTANTS LIMITED	3.56	3.91	1.70
MWH UK LIMITED	3.56	5.39	-0.06
WATERMAN GROUP PLC	3.60	3.50	4.03
PELL FRISCHMANN GROUP LTD	3.77	4.91	4.33
BOVIS LEND LEASE PHARMACEUTICAL LIMITED	4.03	7.38	2.42
MOUCHEL GROUP PLC	4.15	5.05	2.47
SCOTT WILSON SCOTLAND LTD.	4.24	1.28	4.37
WHITE YOUNG GREEN PLC	4.32	4.98	3.41
AMEY OWR LIMITED	4.47	7.23	1.79
STRIDE TREGLOWN GROUP PLC	4.50	5.31	3.87
GED SITEC LIMITED	4.56	7.70	1.52
EARTH TECH ENGINEERING LIMITED	4.79	6.03	4.96
STILES HAROLD WILLIAMS LIMITED	4.80	5.91	3.83
ENVIRON UK LIMITED	5.07	4.22	7.13
OVE ARUP & PARTNERS INTERNATIONAL LIMITED	5.22	5.00	24.17
FOSTER + PARTNERS LIMITED	5.23	5.49	5.68

LAMBERT SMITH HAMPTON GROUP LIMITED	5.23	6.91	3.06
MOUCHEL LIMITED	5.39	6.57	2.46
WOOD GROUP PRESSURE CONTROL LIMITED	5.40	12.27	2.95
SCOTT WILSON RAILWAYS LTD	5.53	7.31	1.70
VERITAS DGC LIMITED	6.17	17.36	3.04
RIBA ENTERPRISES LTD	6.24	6.64	4.55
WATERMAN BUILDING SERVICES LIMITED	6.38	4.30	5.87
INTERSERVE (DEFENCE) LTD	6.96	10.06	4.61
ROXAR LIMITED	7.03	7.16	3.67
DTZ DEBENHAM TIE LEUNG LIMITED	7.20	7.31	6.27
RICARDO PLC	7.53	6.92	8.75
WYG ENVIRONMENT PLANNING TRANSPORT LIMITED	8.02	6.98	10.56
CAPITA SYMONDS LIMITED	8.39	7.18	9.28
FRAZER-NASH CONSULTANCY LIMITED	8.55	11.57	4.31
WATERMAN STRUCTURES LIMITED	8.60	9.37	5.64
ARCADIS AYH PLC	8.71	6.96	7.37
R P S GROUP PLC	8.74	9.67	8.33
WSP DEVELOPMENT AND TRANSPORTATION LIMITED	9.82	8.88	10.33
TERENCE O'ROURKE LIMITED	9.95	8.07	11.82
THE ENVIRONMENTAL CONSULTANCY LIMITED	10.20	9.76	10.78
HUNTER & PARTNERS LIMITED	11.77	11.18	12.20
KBC PROCESS TECHNOLOGY LIMITED	13.14	-9.39	42.35
SCOTT BROWNRIGG LIMITED	13.57	14.78	15.26
BECHTEL LIMITED	18.76	59.53	9.80
FORTUM O&M (UK) LIMITED	37.42	6.10	39.67
LLEWELYN-DAVIES LIMITED	617.92	-1.49	0.44

Labour Productivity Ratio: Capital Employed / Employees

	Productivity		
Company name:	Capital Employed / Employees		
	10 yr average (£th/emp)	present 3yr av. (£th/emp)	past 3yr av. (£th/emp)
ON-LINE DESIGN & ENGINEERING LIMITED	21.19	23.19	34.60
PIPER GROUP PLC	21.86	28.13	19.39
DESURVEY PLC	23.83	28.57	23.81
WATERMAN ASPEN LIMITED	29.12	35.95	27.26
JACOBS U.K. LIMITED	32.14	39.07	27.42
COLIN BUCHANAN AND PARTNERS LIMITED	36.44	39.82	28.22
ELECTROWATT CONSULTANTS LIMITED	37.53	44.43	33.22
FAITHFUL+GOULD LIMITED	37.69	35.49	29.62
STRIDE TREGLOWN LIMITED	39.40	43.16	34.11
WSP CIVILS LIMITED	40.24	46.50	35.02
GED SITEC LIMITED	40.62	54.92	23.00
STRIDE TREGLOWN GROUP PLC	41.68	45.54	36.61
STILES HAROLD WILLIAMS LIMITED	42.47	47.22	41.60
GRONTMIJ GROUP LIMITED	42.69	38.28	39.87
TERENCE O'ROURKE LIMITED	43.55	44.79	40.43
MOUCHEL GROUP PLC	45.57	45.23	37.97
NNN LIMITED	46.10	53.48	38.09
ASSYSTEM GROUP UK LIMITED	46.31	51.67	41.60
OVE ARUP & PARTNERS HONG KONG LIMITED	48.17	36.77	73.69
AMEY OWR LIMITED	48.54	63.96	35.42
MWH UK LIMITED	49.63	51.71	49.76
HASKONING UK LIMITED	49.84	61.47	45.10
CORUS RAIL CONSULTANCY LTD	50.63	49.06	43.96
PRP ARCHITECTS LIMITED	51.07	54.45	36.33
MOTT MACDONALD GROUP LIMITED	51.29	49.71	55.87
FRAZER-NASH CONSULTANCY LIMITED	52.45	58.69	42.99
HALCROW HOLDINGS LIMITED	52.58	56.60	46.74
JAMES R. KNOWLES (HOLDINGS) LIMITED	53.12	60.87	48.87
COMMTECH LIMITED	53.85	39.66	72.73
KEPPIE DESIGN LIMITED	54.04	55.80	32.15

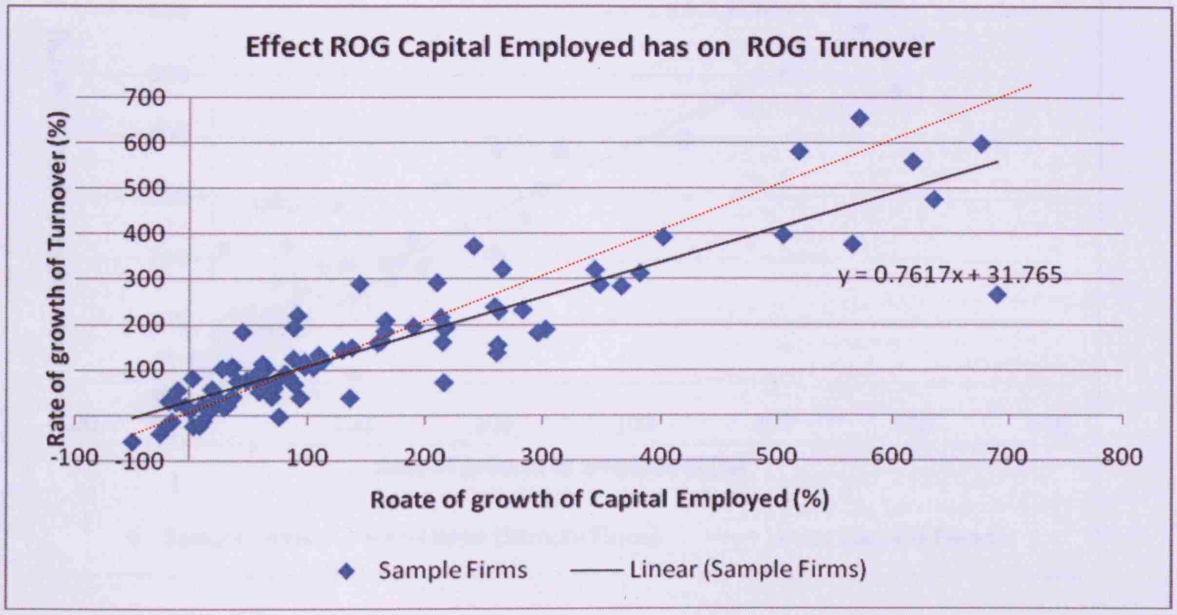
ARUP GROUP LIMITED	54.36	59.04	56.35
ROUGHTON GROUP LIMITED	55.72	53.90	54.69
HYDER CONSULTING PLC	56.10	48.61	153.45
LLEWELYN-DAVIES LIMITED	57.52	71.16	58.79
HYDER CONSULTING (UK) LIMITED	59.14	46.03	64.03
FABER MAUNSELL LIMITED	59.26	61.25	55.54
MOUCHEL LIMITED	59.56	61.23	36.51
ASSYSTEM UK LIMITED	59.86	64.49	51.58
SCOTT WILSON RAILWAYS LTD	60.14	73.77	42.62
URS CORPORATION LIMITED	60.67	76.58	40.43
WS ATKINS PLC	61.19	77.00	53.29
CAMERON TAYLOR ONE LIMITED	61.82	61.96	56.86
GOLDER ASSOCIATES (UK) LIMITED	62.18	61.79	58.57
BURO HAPPOLD ENGINEERS LIMITED	62.95	74.64	30.25
PELL FRISCHMANN CONSULTANTS LIMITED	63.84	62.45	44.90
WATERMAN BUILDING SERVICES LIMITED	63.87	66.02	63.52
WSP GROUP PLC	64.17	70.02	48.35
EPR ARCHITECTS LIMITED	64.37	72.29	50.57
MERPRO LIMITED	65.66	67.37	47.18
RIBA ENTERPRISES LTD	66.62	76.08	58.78
MOTT MACDONALD LIMITED	69.85	63.01	74.44
AUKETT FITZROY ROBINSON GROUP PLC	70.37	84.10	63.07
PB LTD	71.18	73.49	54.91
BENOY LIMITED	71.40	92.86	46.58
WATERMAN GROUP PLC	71.45	86.27	52.85
DTZ DEBENHAM TIE LEUNG LIMITED	72.39	86.72	61.96
WSP UK LIMITED	73.93	74.23	54.76
WSP DEVELOPMENT AND TRANSPORTATION LIMITED	74.22	72.62	73.61
OVE ARUP & PARTNERS INTERNATIONAL LIMITED	75.13	79.14	200.22
ARCADIS AYH PLC	77.11	100.11	55.71
BUILDING DESIGN PARTNERSHIP LIMITED	78.13	86.33	79.47
WYG ENGINEERING LIMITED	79.50	90.76	56.96
WYG ENVIRONMENT PLANNING TRANSPORT LIMITED	79.63	82.93	62.58
SCOTT WILSON SCOTLAND LTD.	81.71	107.29	67.74
WHITE YOUNG GREEN PLC	83.84	106.76	48.58
ARUP NORTH AMERICA LIMITED	87.97	91.12	81.88
THE ENVIRONMENTAL CONSULTANCY LIMITED	88.50	81.31	70.40

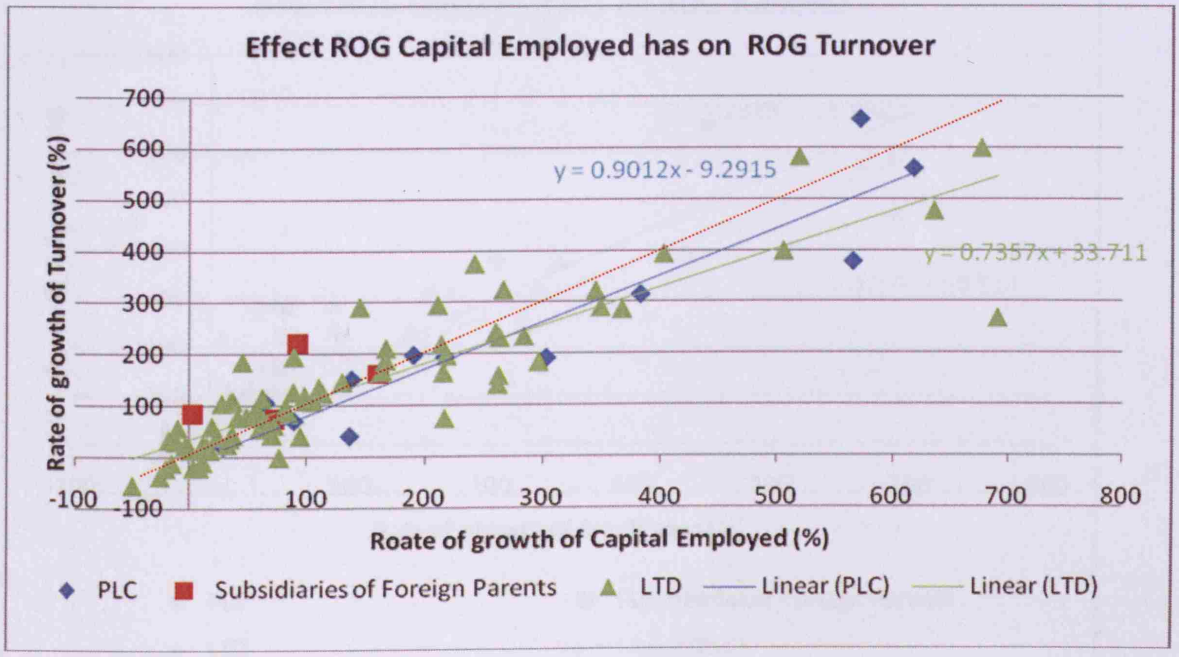
LAMBERT SMITH HAMPTON GROUP LIMITED	92.97	72.32	65.08
FOSTER + PARTNERS LIMITED	97.13	112.80	87.22
CAPITA SYMONDS LIMITED	99.94	104.89	83.52
HUNTER & PARTNERS LIMITED	100.15	111.81	83.04
TPS CONSULT LIMITED	102.51	116.32	110.82
R P S GROUP PLC	102.83	105.41	70.90
FORTUM O&M (UK) LIMITED	103.21	127.42	77.73
SCOTT BROWNRIGG LIMITED	103.91	107.74	92.96
PELL FRISCHMANN GROUP LTD	104.85	96.88	120.68
MSX INTERNATIONAL LIMITED	109.91	124.75	140.22
RTKL-UK LTD.	113.51	100.04	127.28
DET NORSKE VERITAS LIMITED	116.79	144.57	90.13
RICARDO PLC	116.97	133.55	97.38
ENVIRON UK LIMITED	117.42	135.22	77.82
WATERMAN STRUCTURES LIMITED	117.81	164.93	80.22
PENSPEN LIMITED	125.07	168.72	122.27
JACOBS ENGINEERING U.K. LIMITED	130.40	117.54	137.85
INTERSERVE (DEFENCE) LTD	130.87	121.20	157.37
BOVIS LEND LEASE PHARMACEUTICAL LIMITED	139.53	193.11	66.71
EARTH TECH ENGINEERING LIMITED	148.55	167.43	109.42
PARSONS BRINCKERHOFF LTD	153.68	216.56	119.82
ROXAR LIMITED	170.96	240.24	118.39
ROGERS STIRK HARBOUR + PARTNERS LIMITED	177.94	220.41	139.10
WOOD GROUP PRESSURE CONTROL LIMITED	178.00	216.87	72.50
KBC PROCESS TECHNOLOGY LIMITED	236.02	250.19	223.17
VERITAS DGC LIMITED	240.46	320.48	152.01
BECHTEL LIMITED	268.73	269.72	305.46

Appendix 4: Regression Series

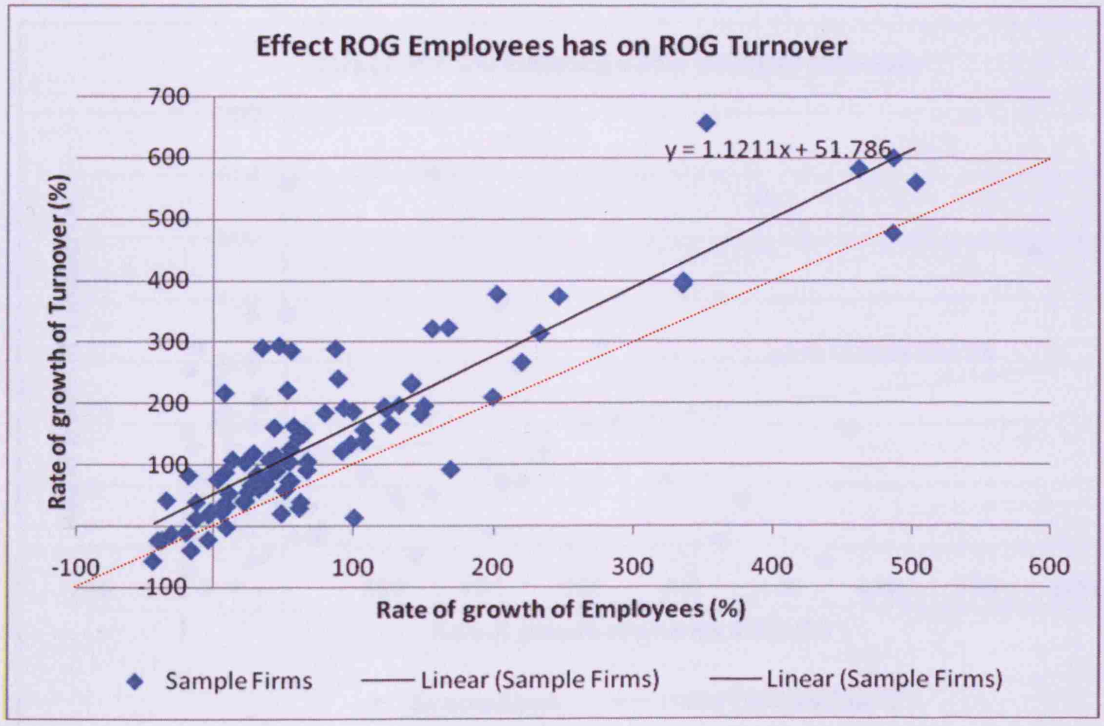
Appendix 4A: Impact of variables on ROG Turnover

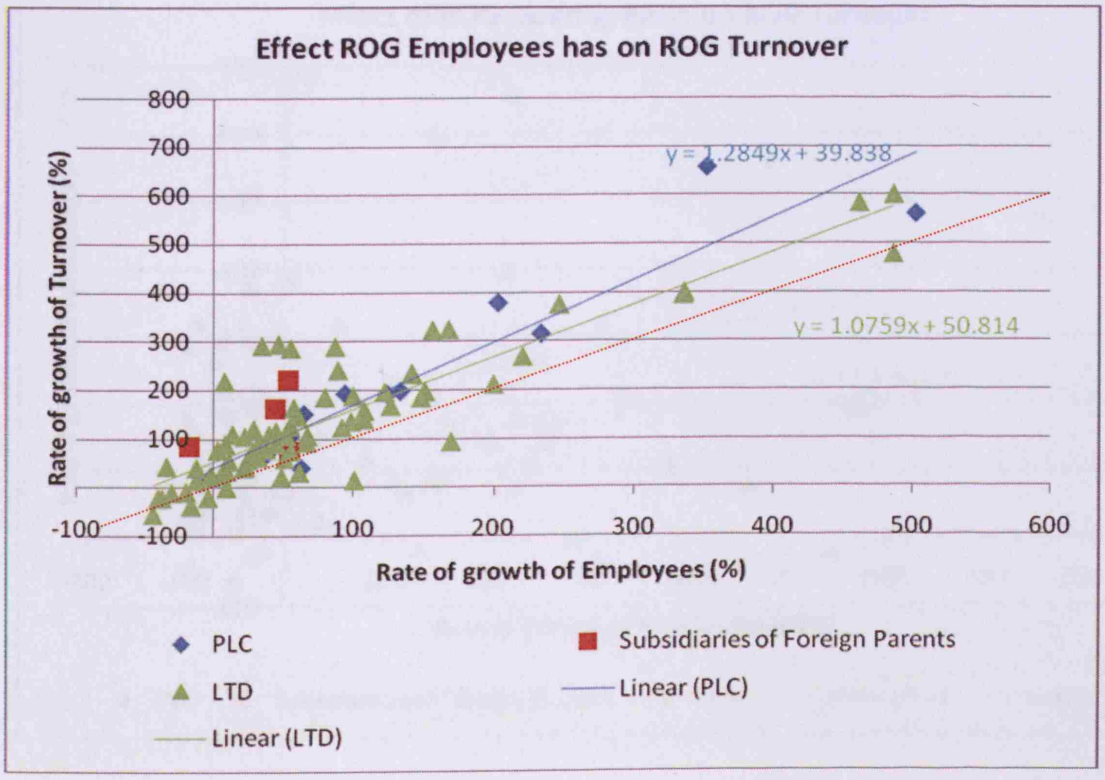
Effect ROG Capital Employed on ROG Turnover



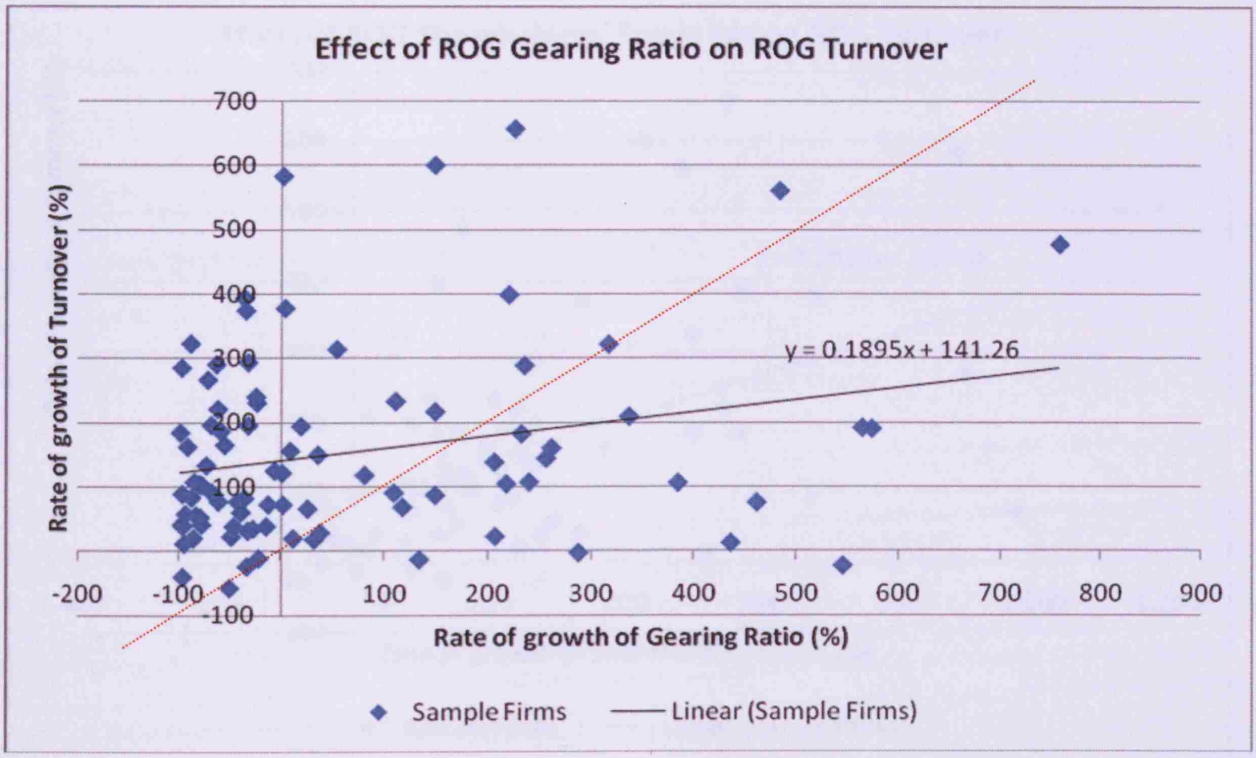


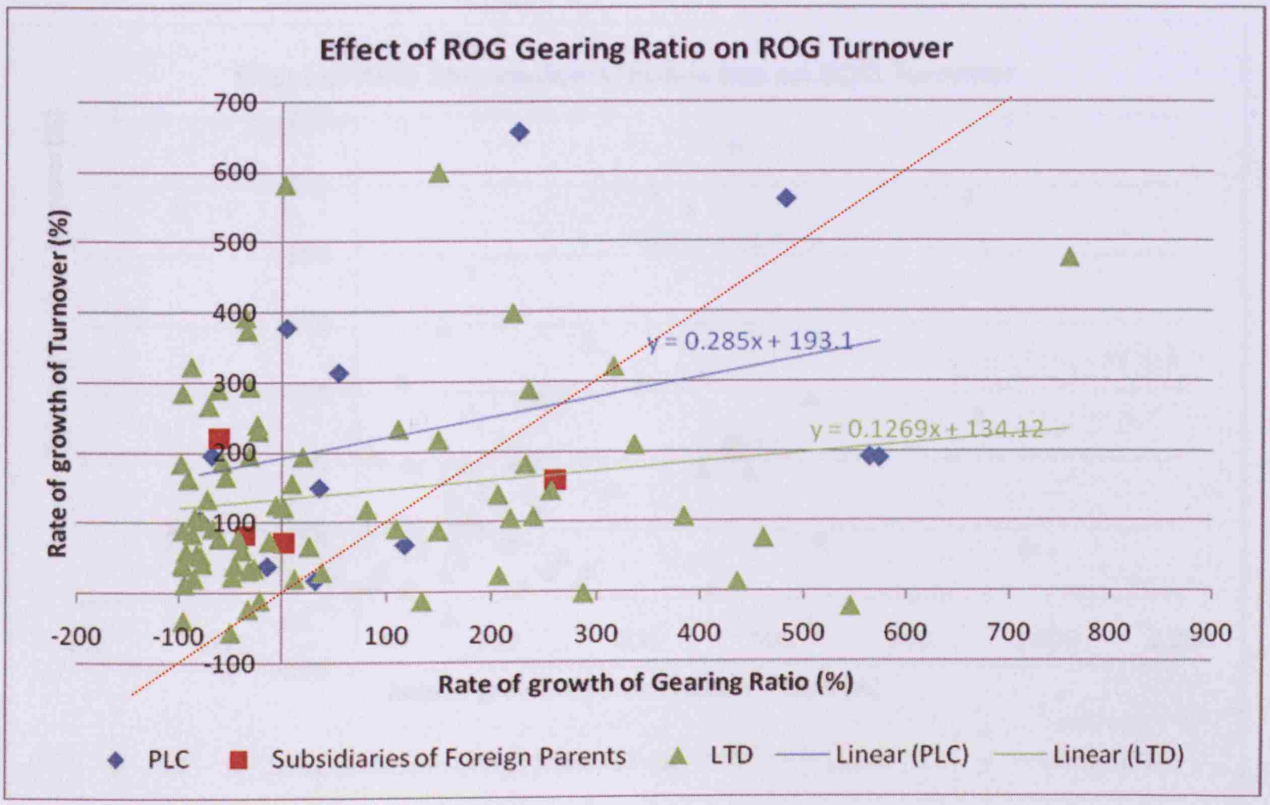
Impact of ROG Employees on ROG Turnover



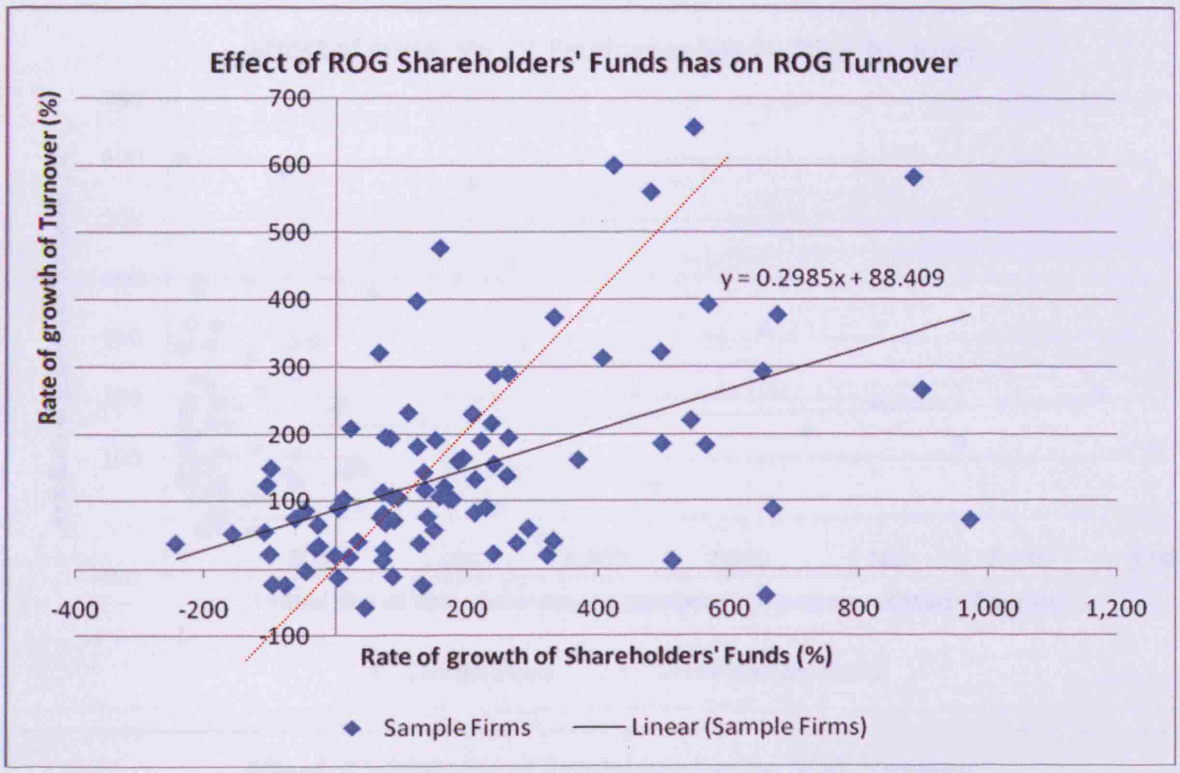


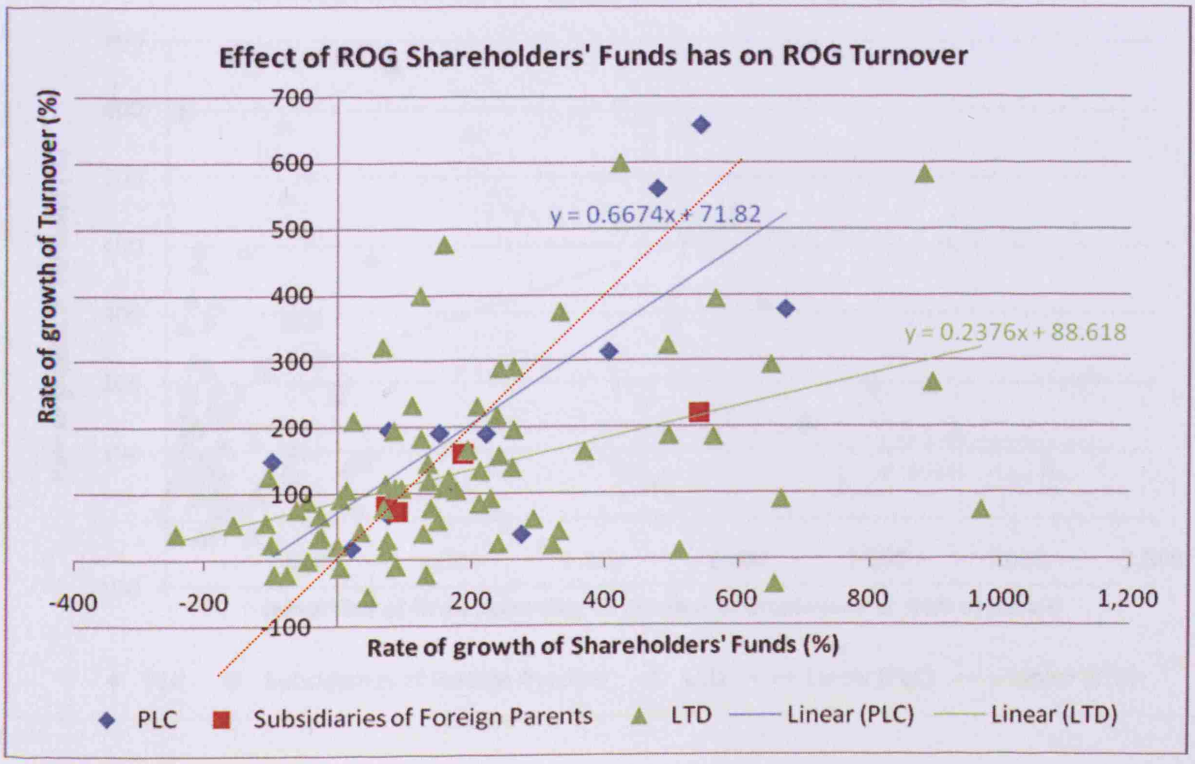
Impact of ROG Gearing Ratio on ROG Turnover



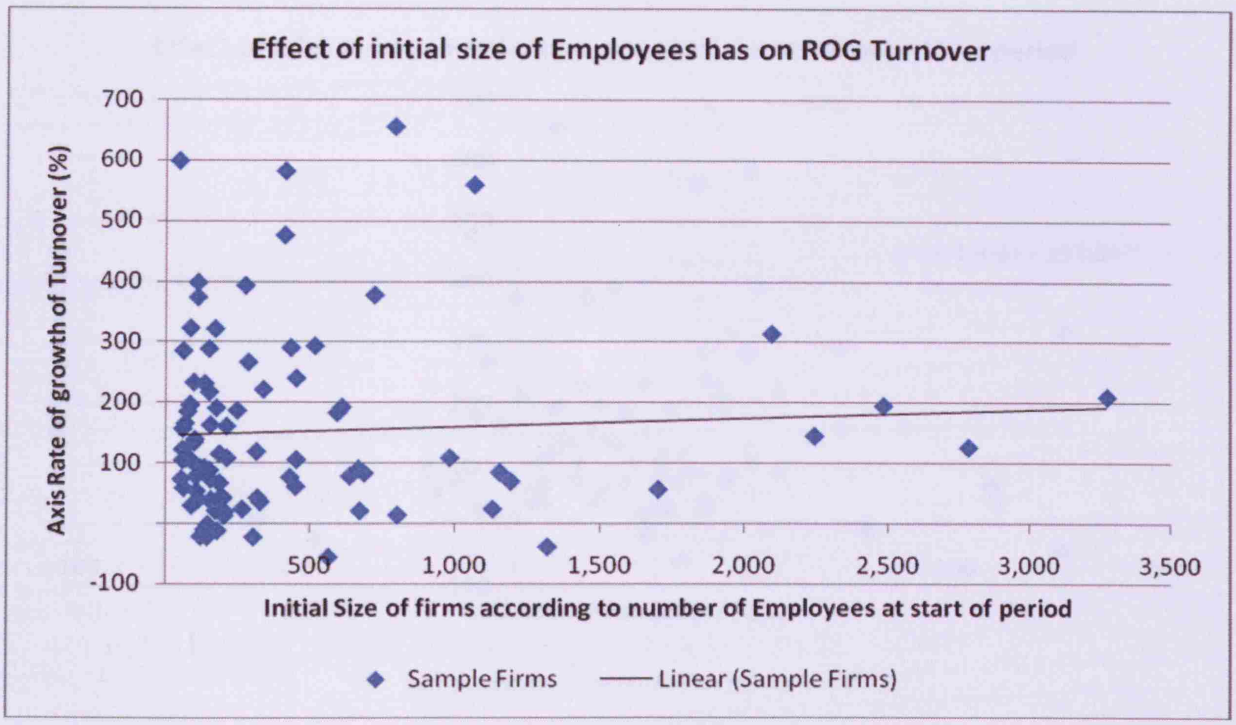


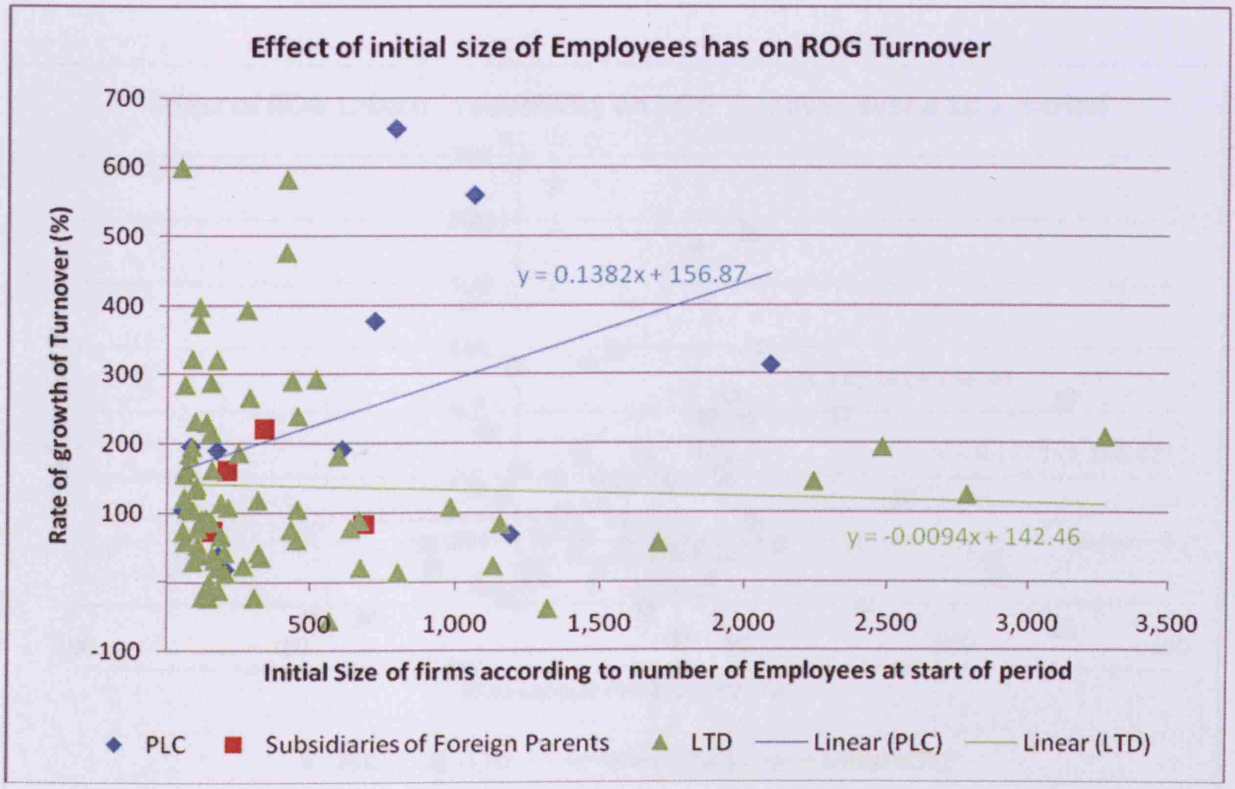
Impact of ROG Shareholders Funds on RGO Turnover



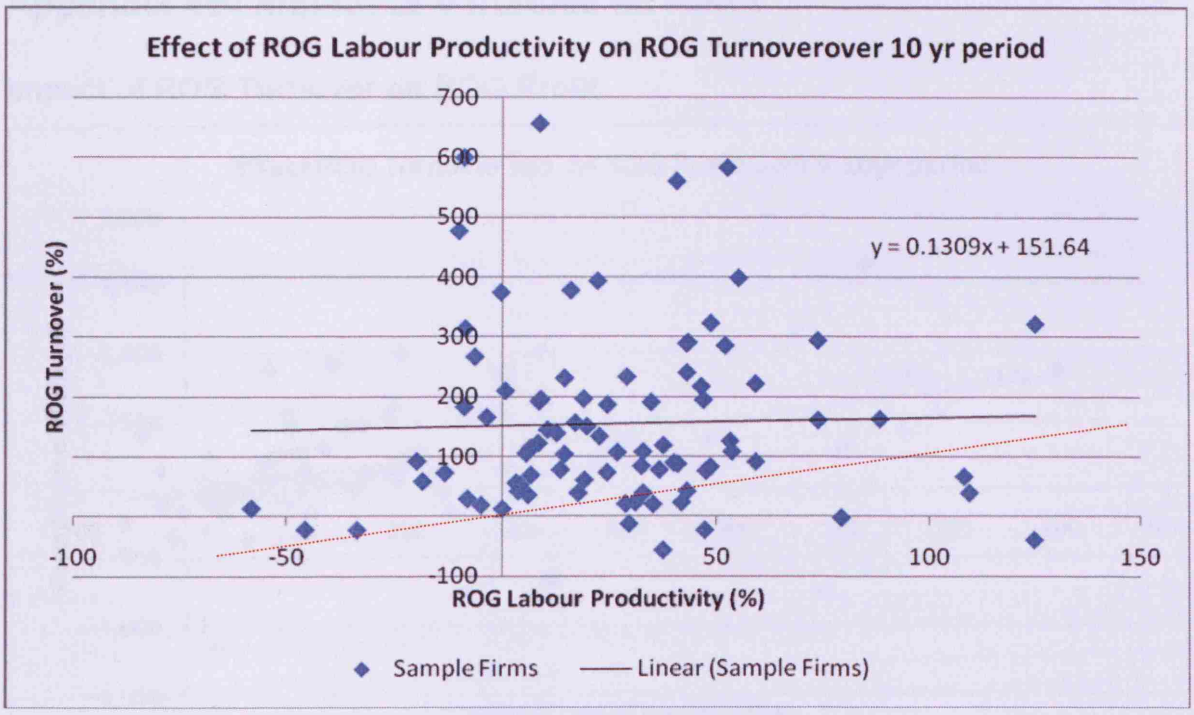


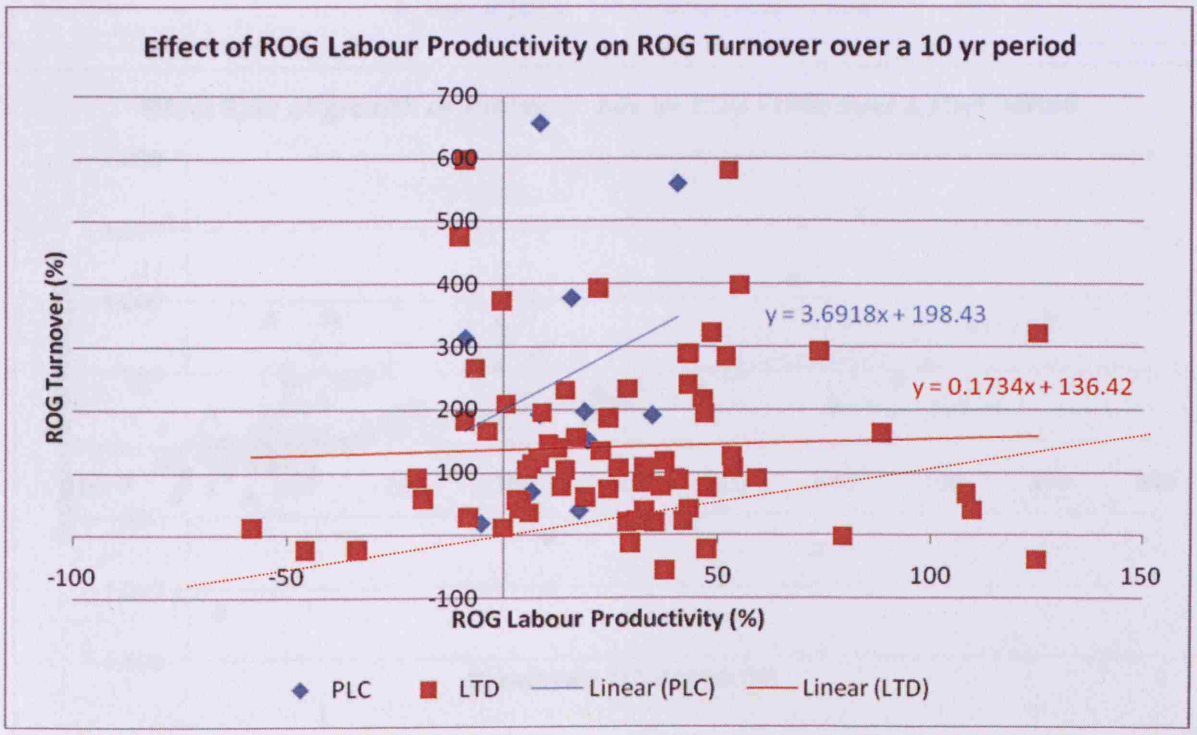
Impact of Initial Size Employees on ROG Turnover





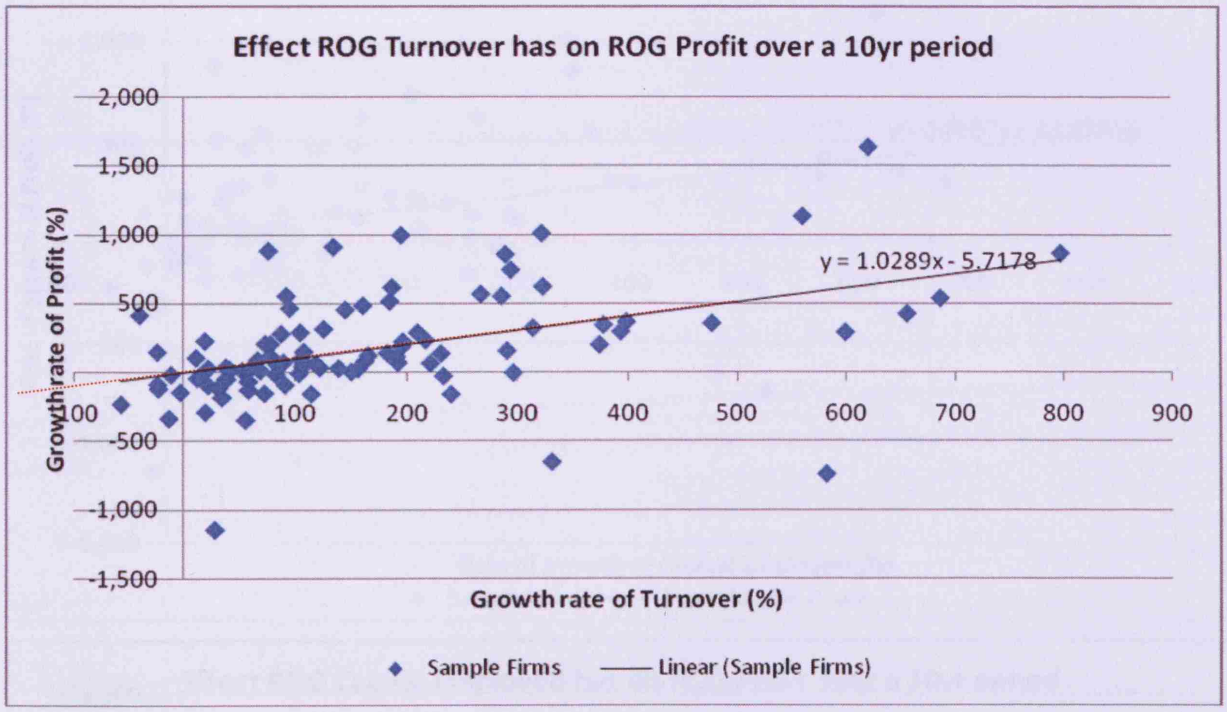
Impact of ROG Labour Productivity on ROG Turnover

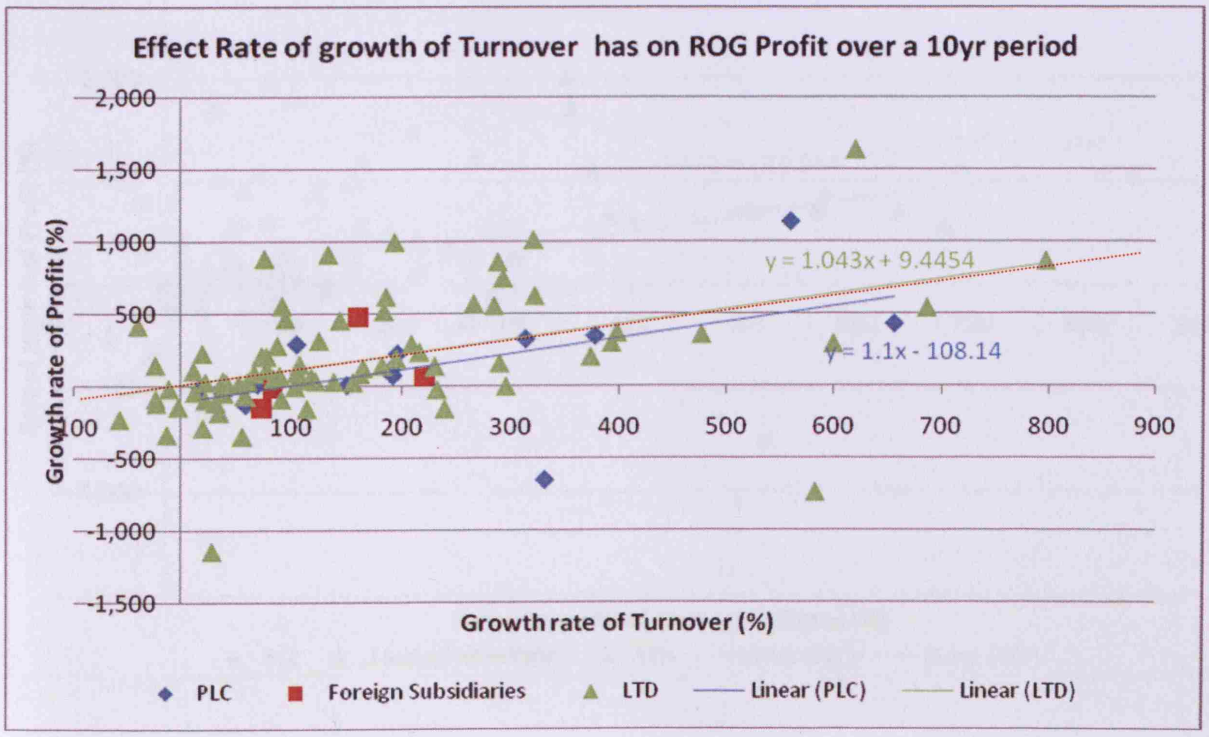




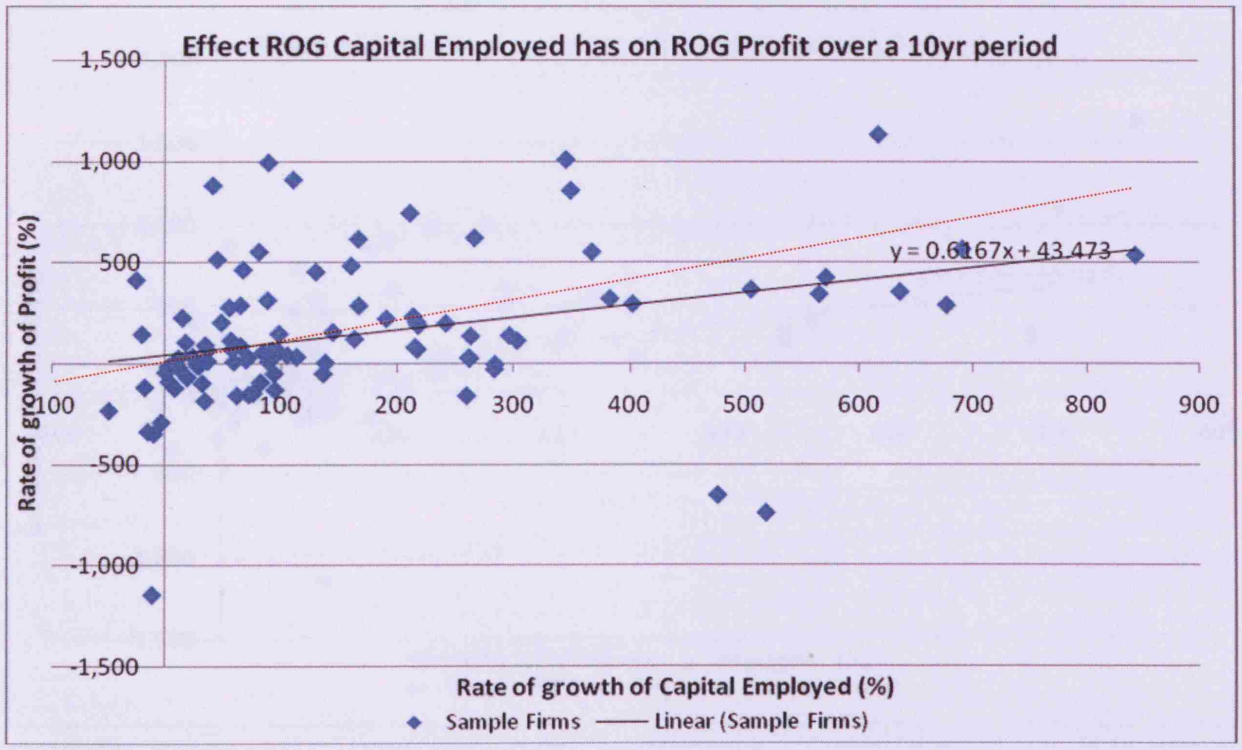
Appendix 4B: Impact of Variables on Profit

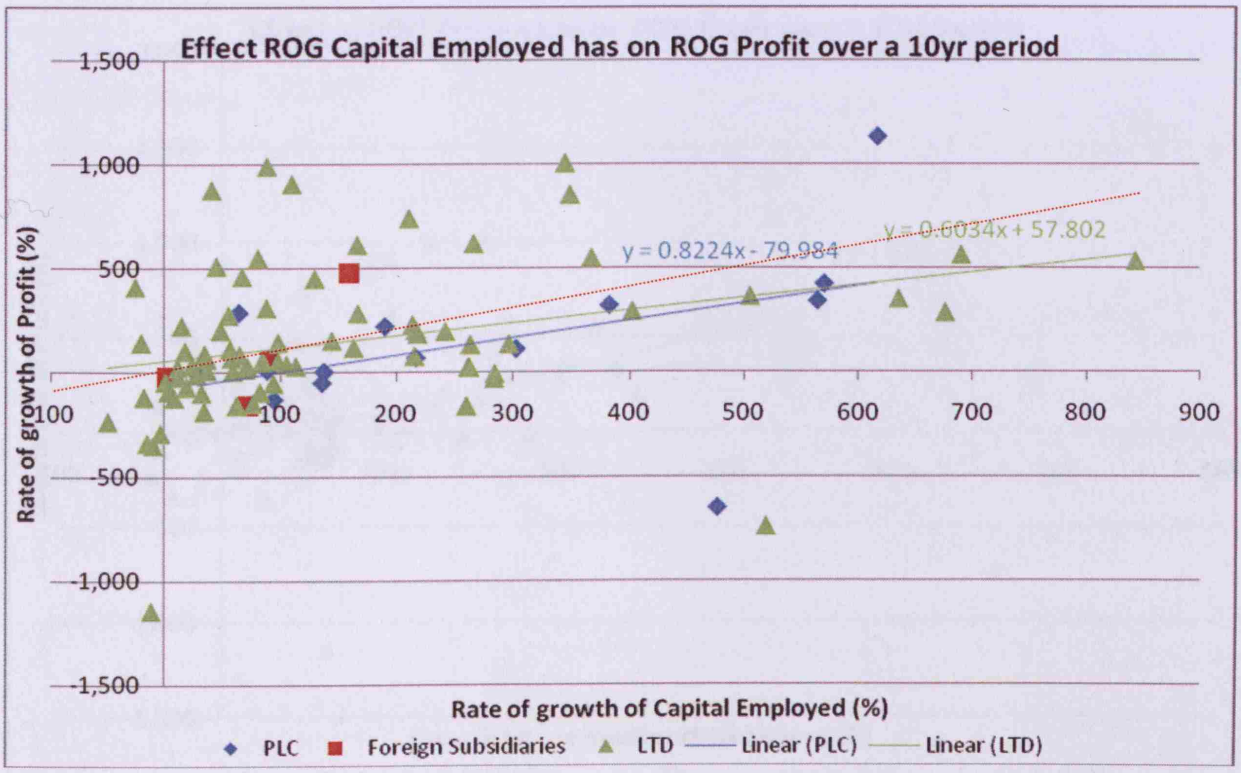
Impact of ROG Turnover on ROG Profit



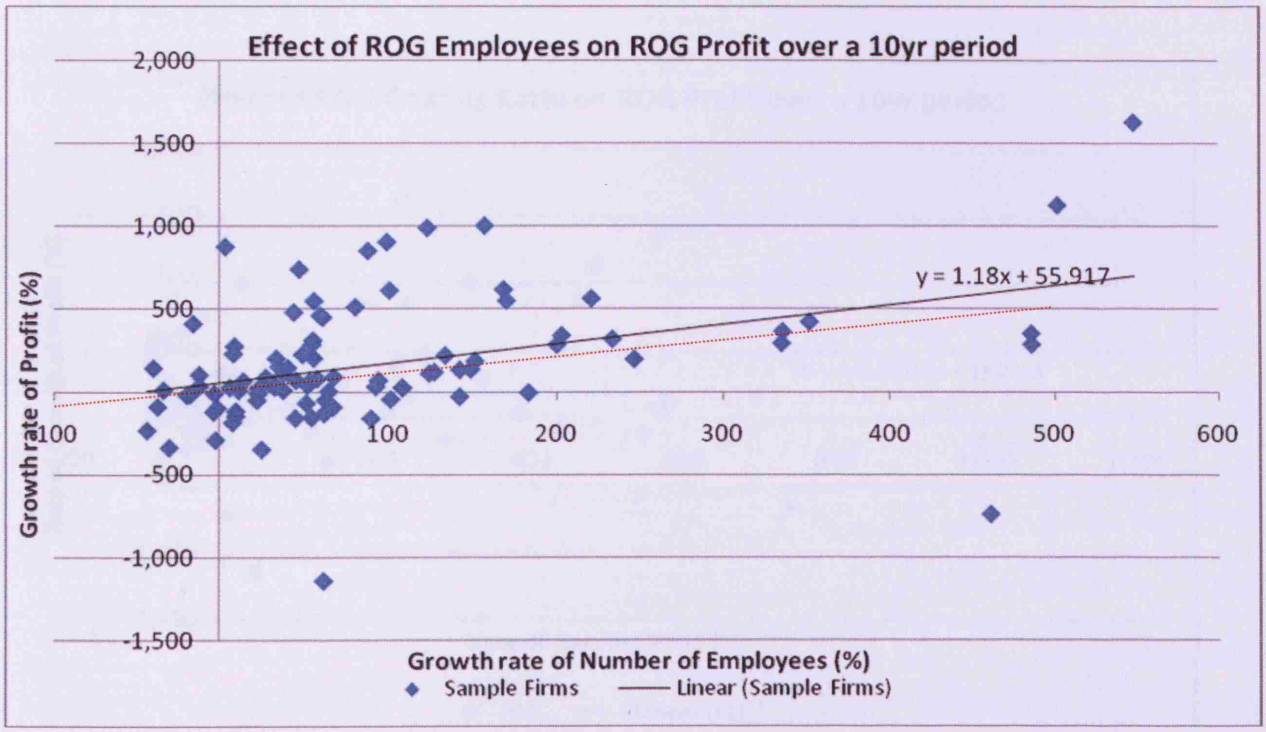


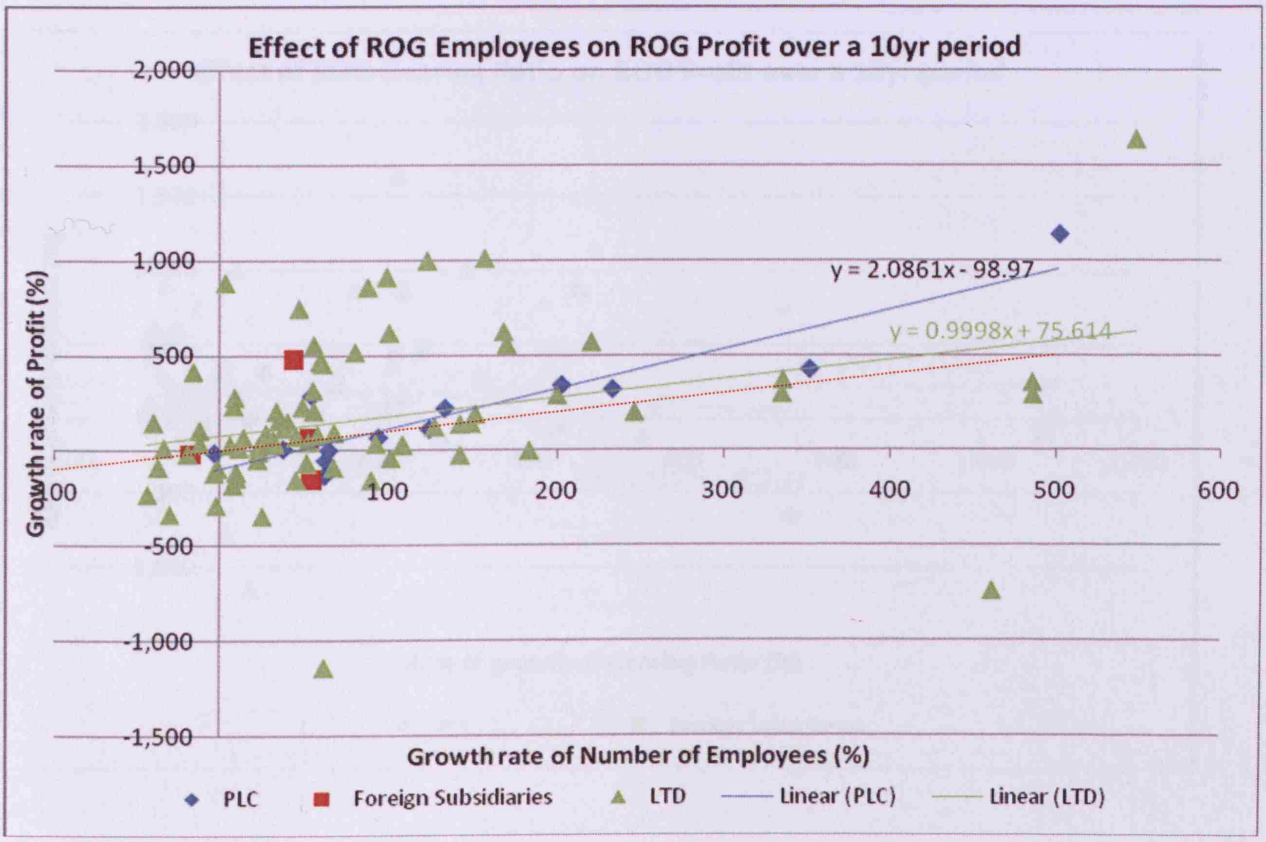
Impact of ROG Capital Employed on ROG Profit



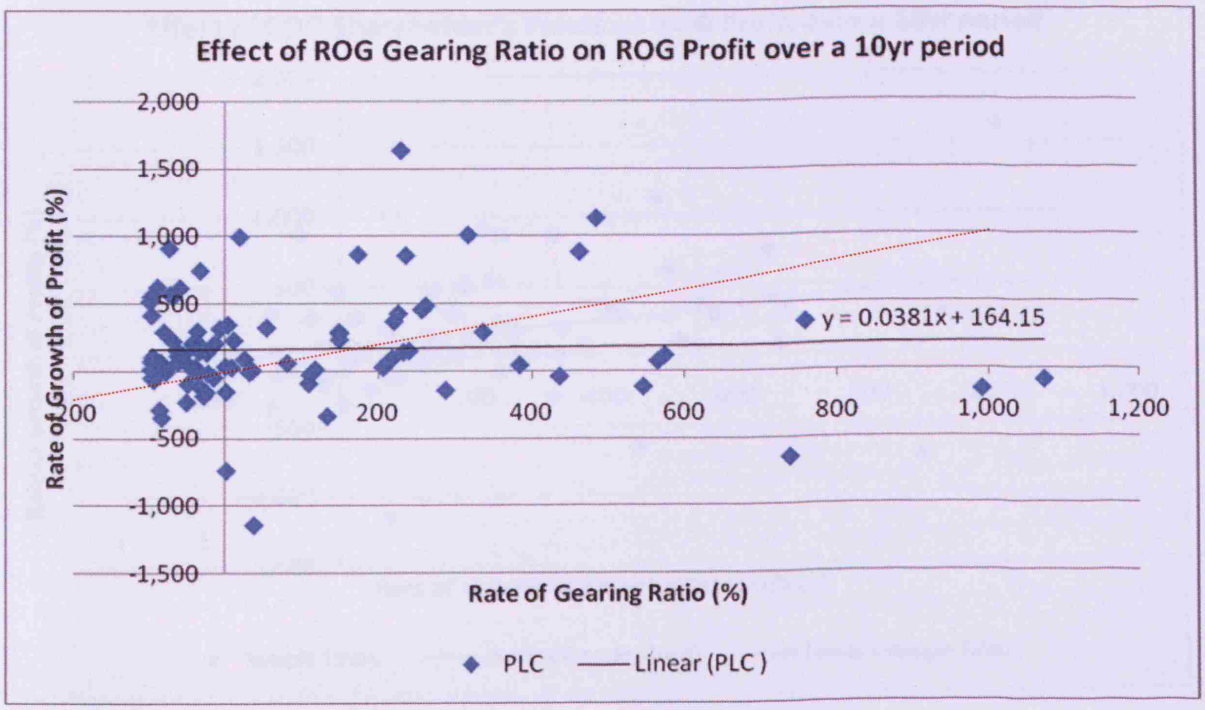


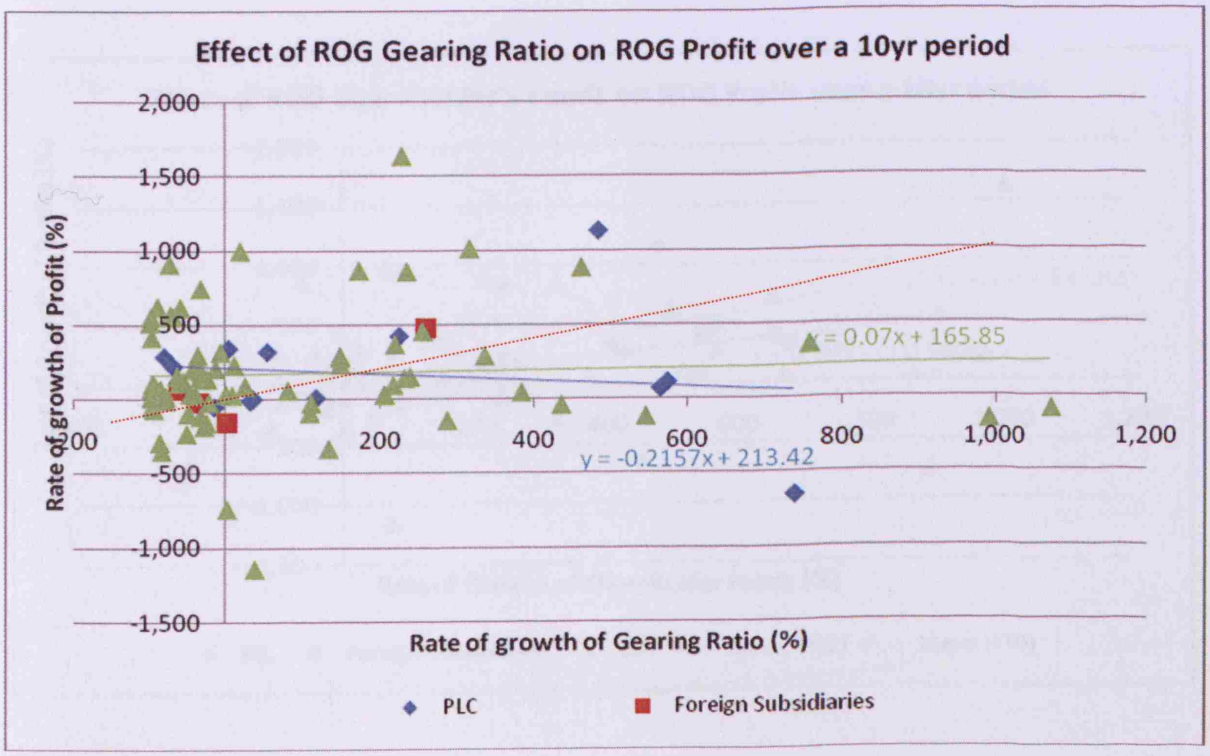
Impact of ROG Employees on ROG Profit



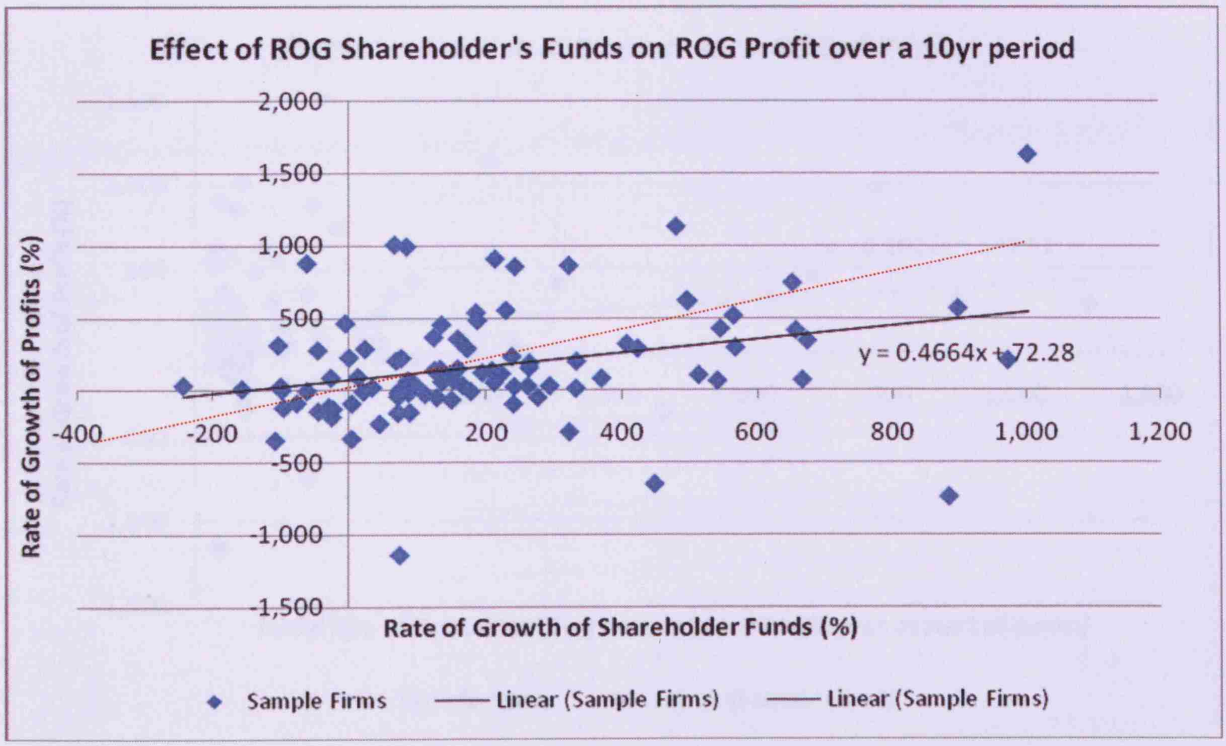


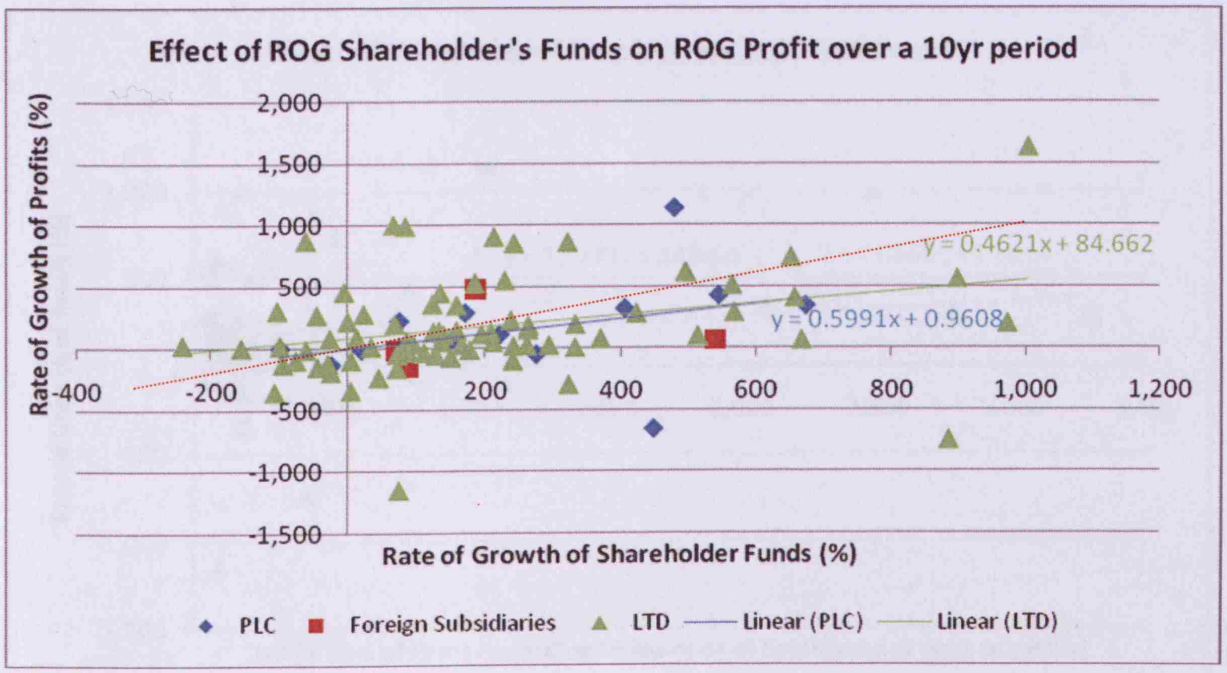
Impact of ROG Gearing Ratio on ROG Profit



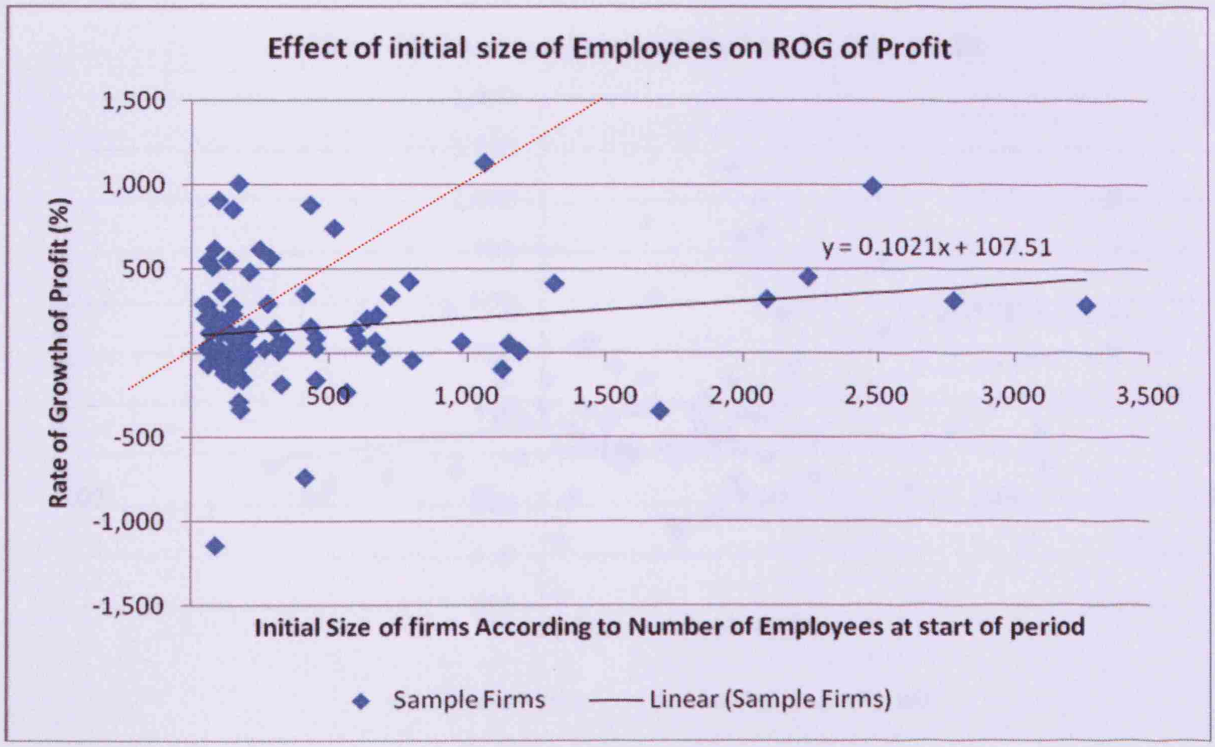


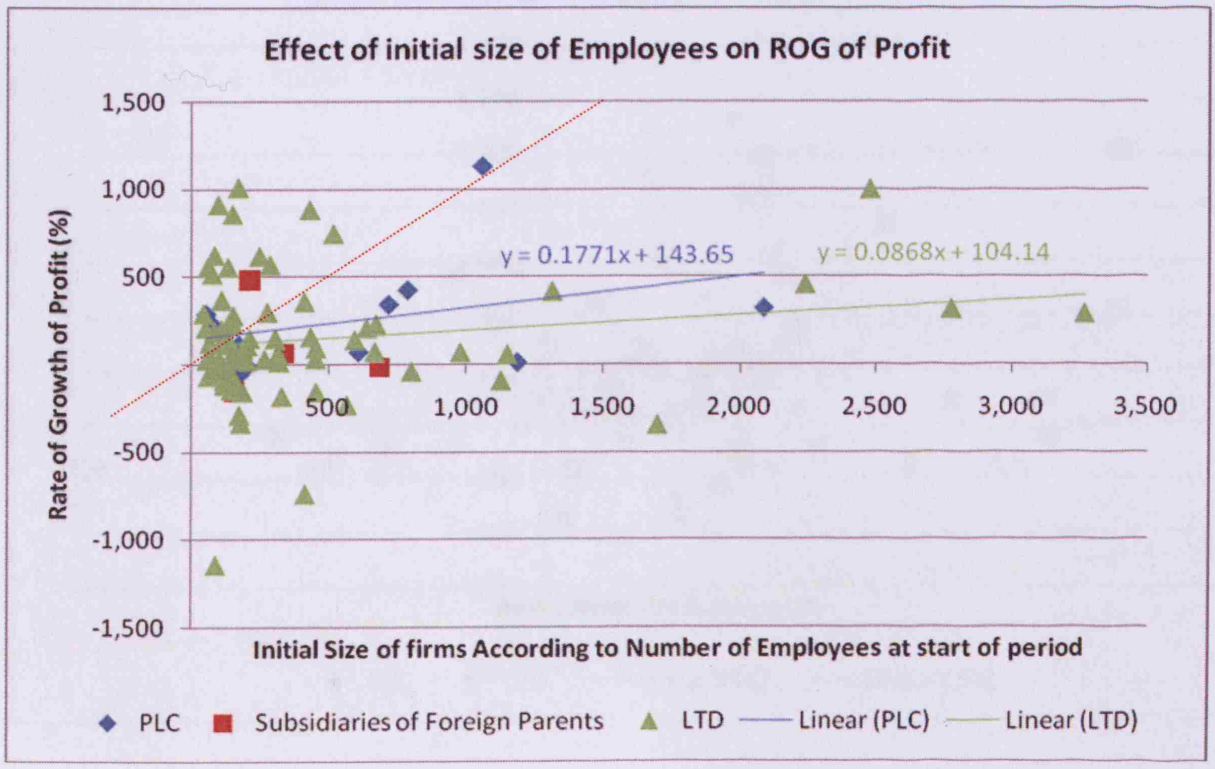
Impact of ROG Shareholders' Funds on ROG Profit



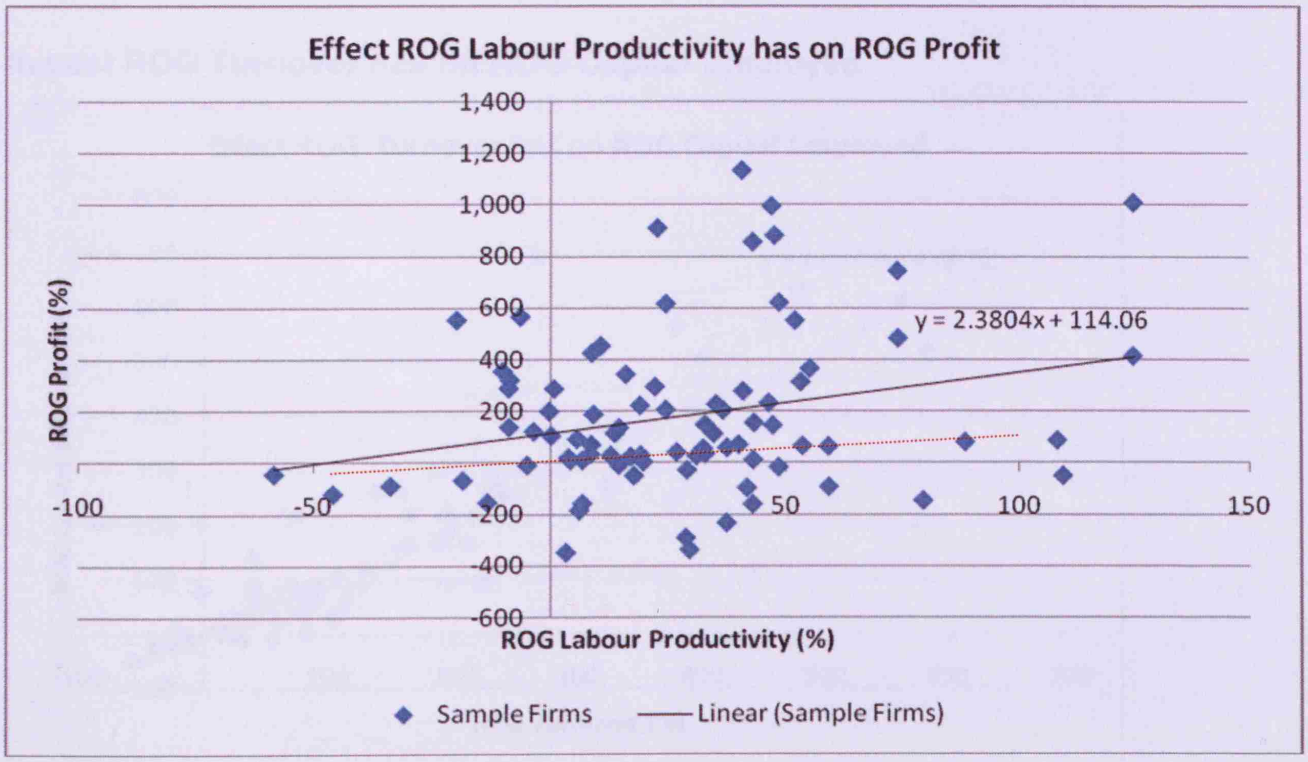


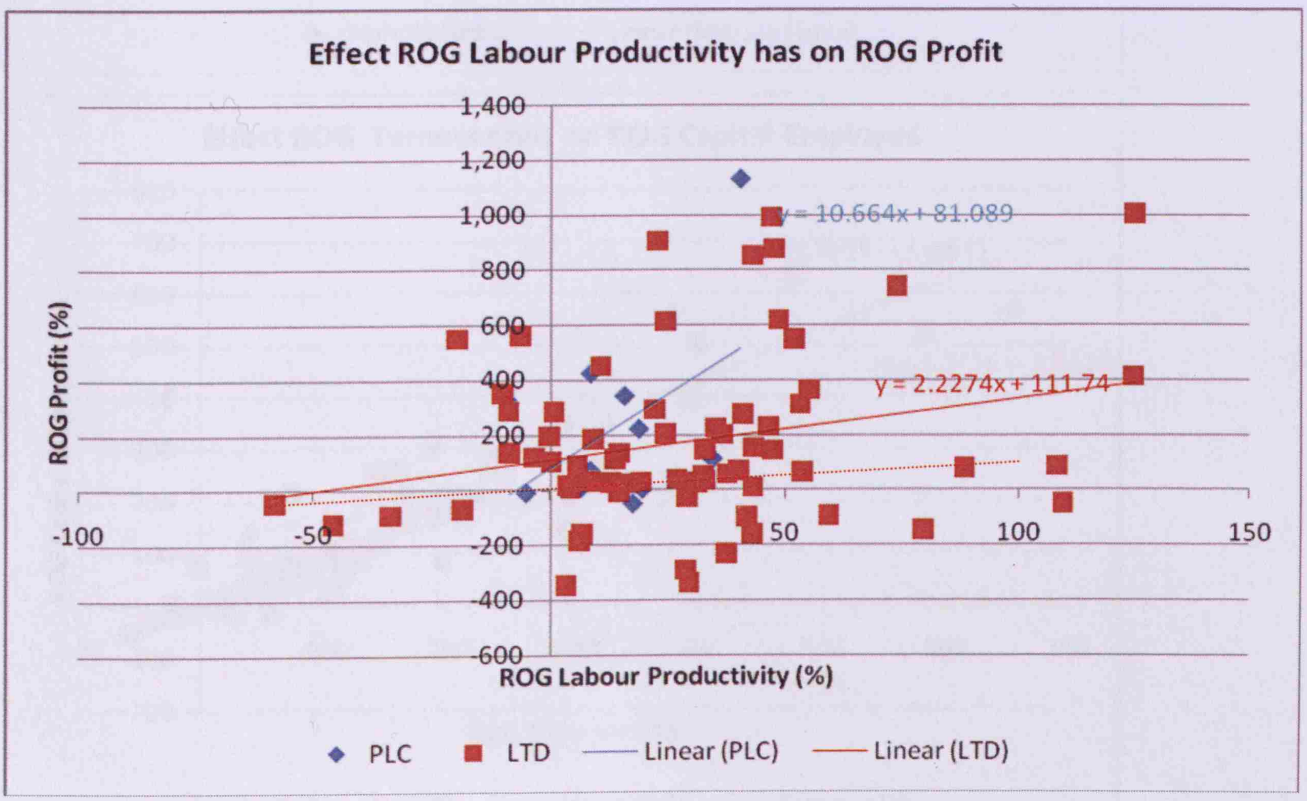
Impact of Initial Size of Employees on ROG Profit





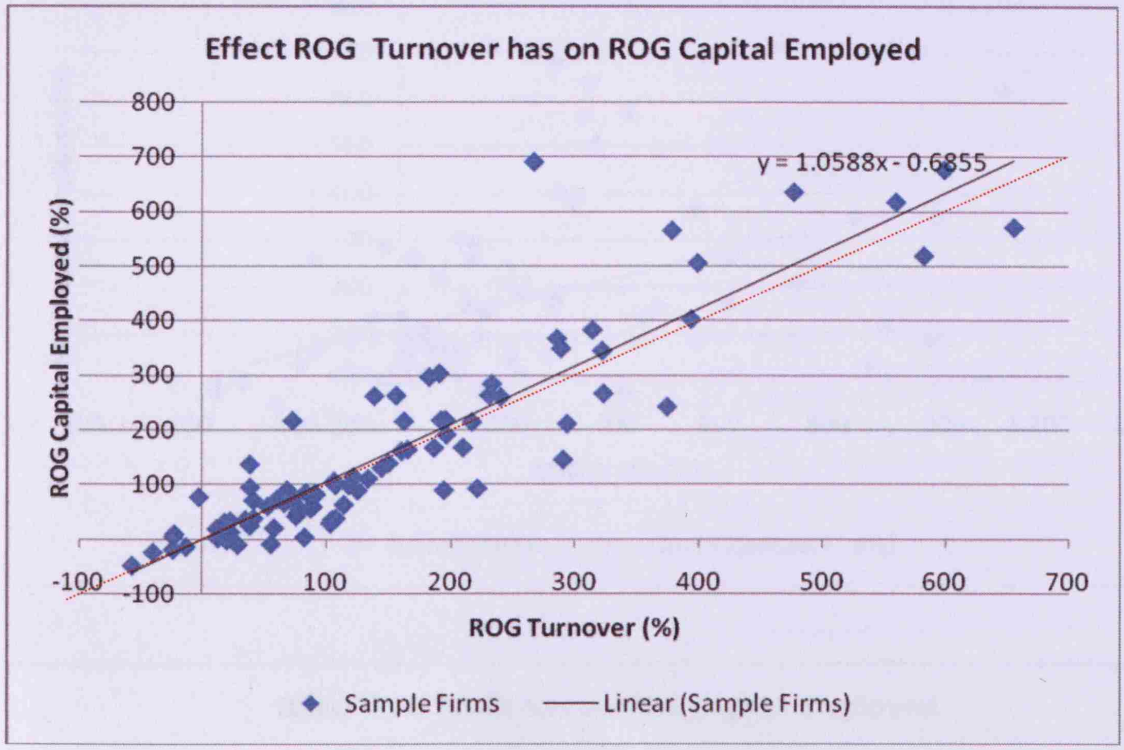
Impact of ROG Labour Productivity on ROG Profit

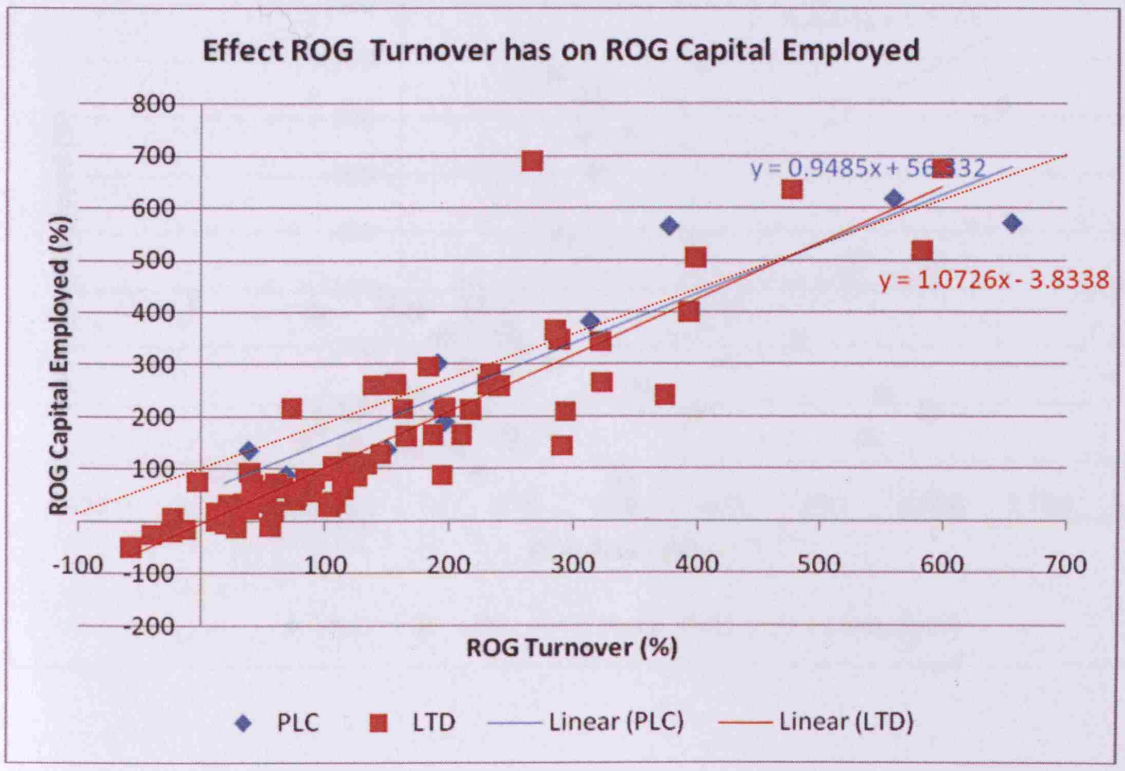




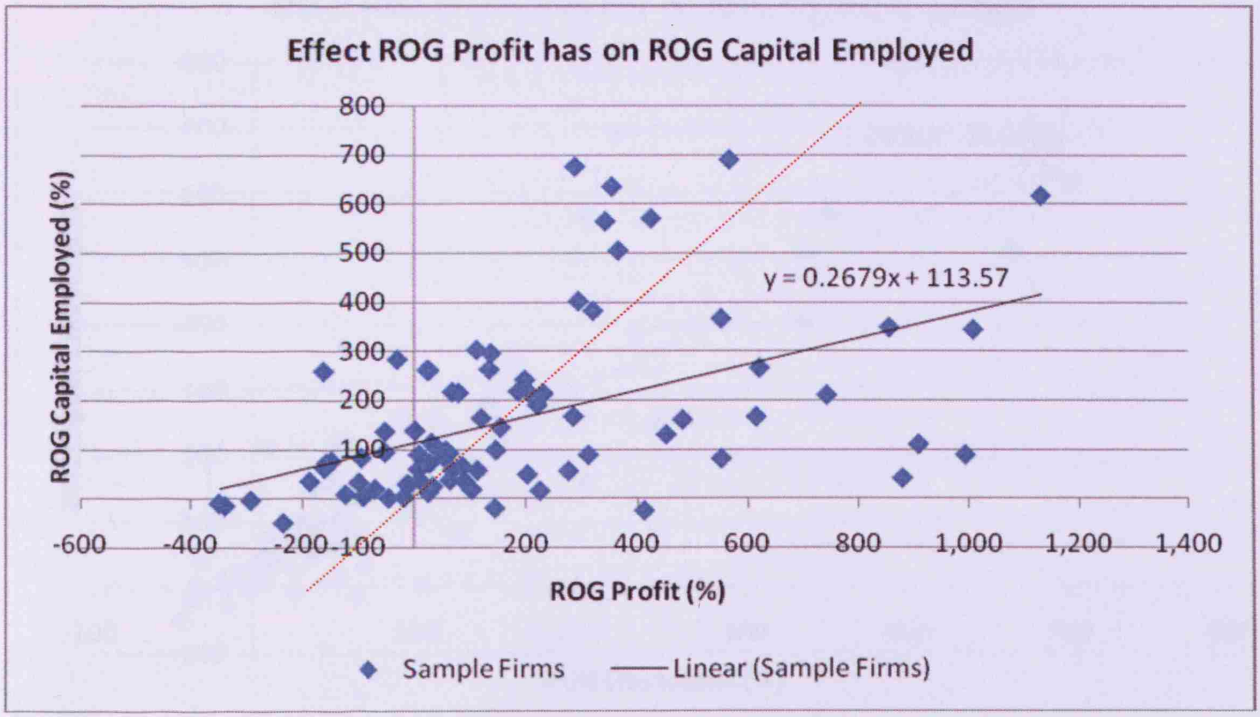
Appendix 4C: Impact of Variables on ROG Capital Employed

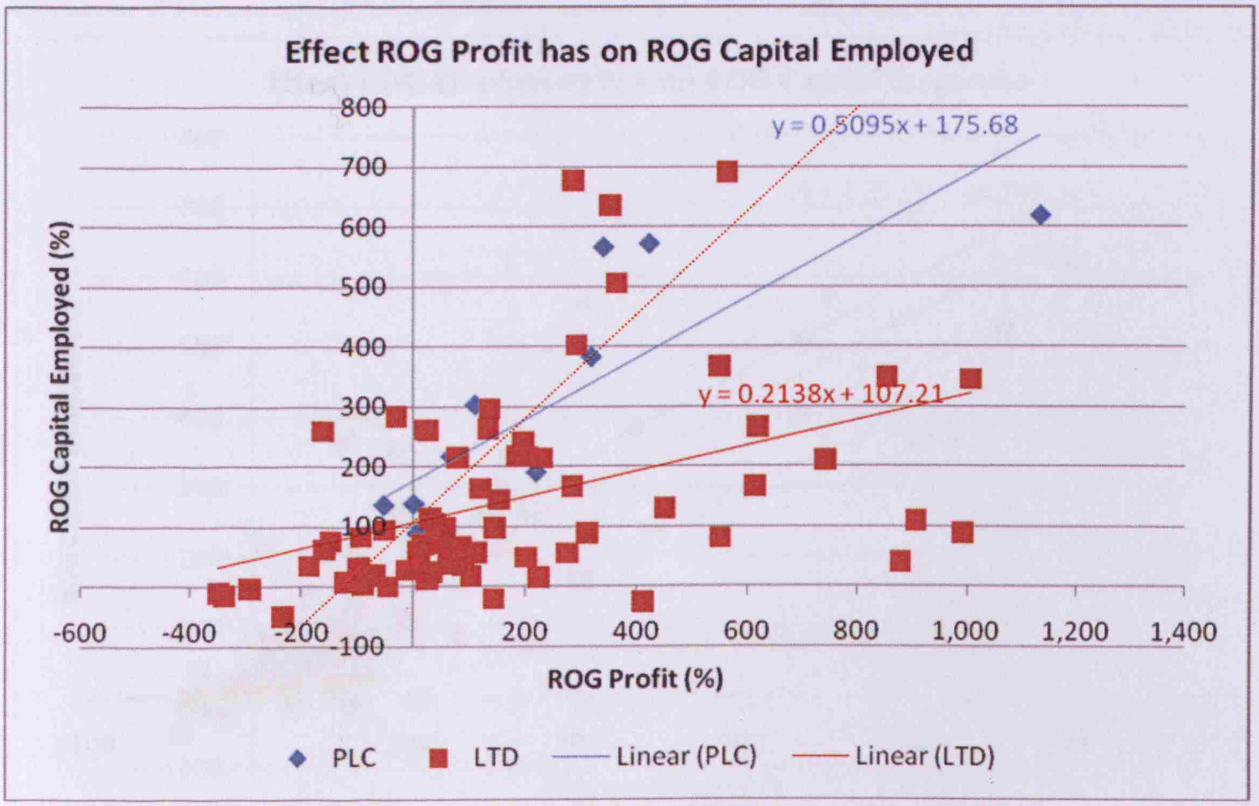
Impact ROG Turnover has on ROG Capital Employed



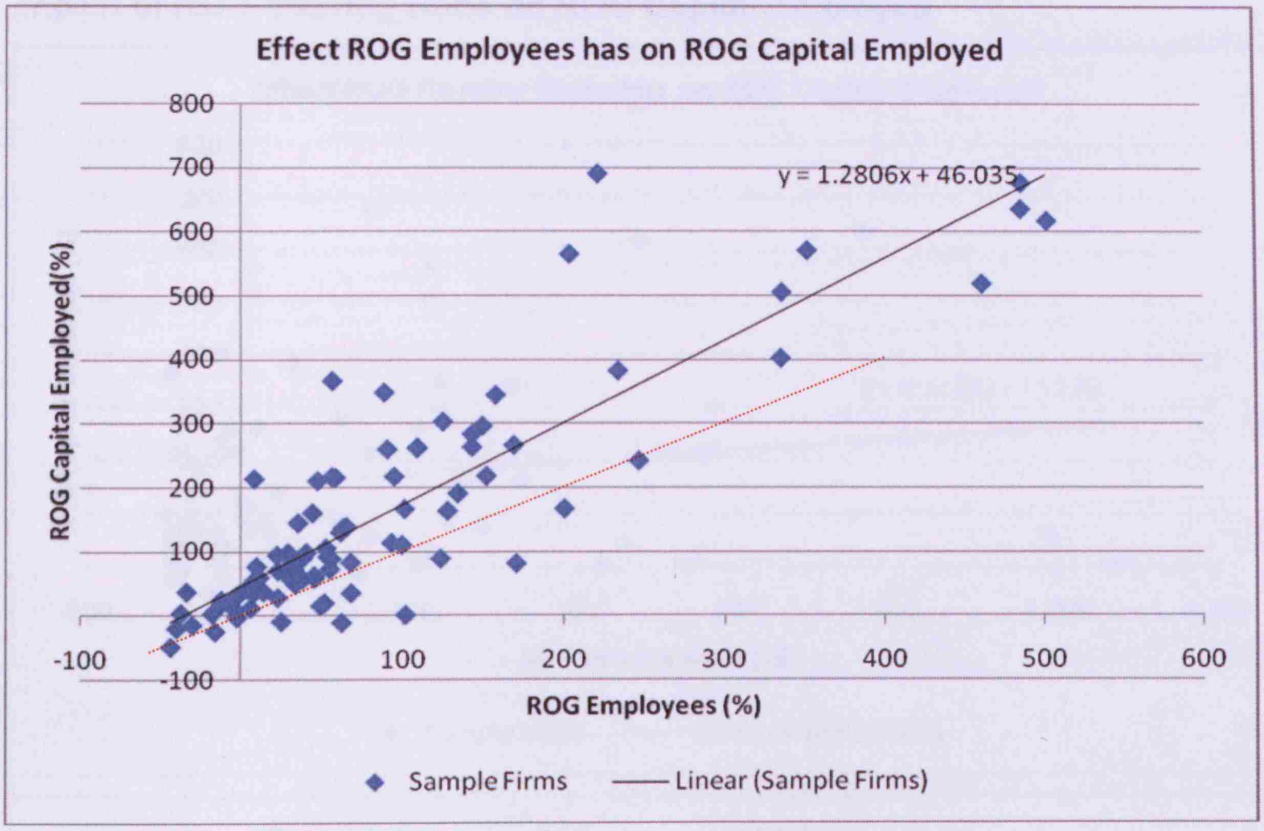


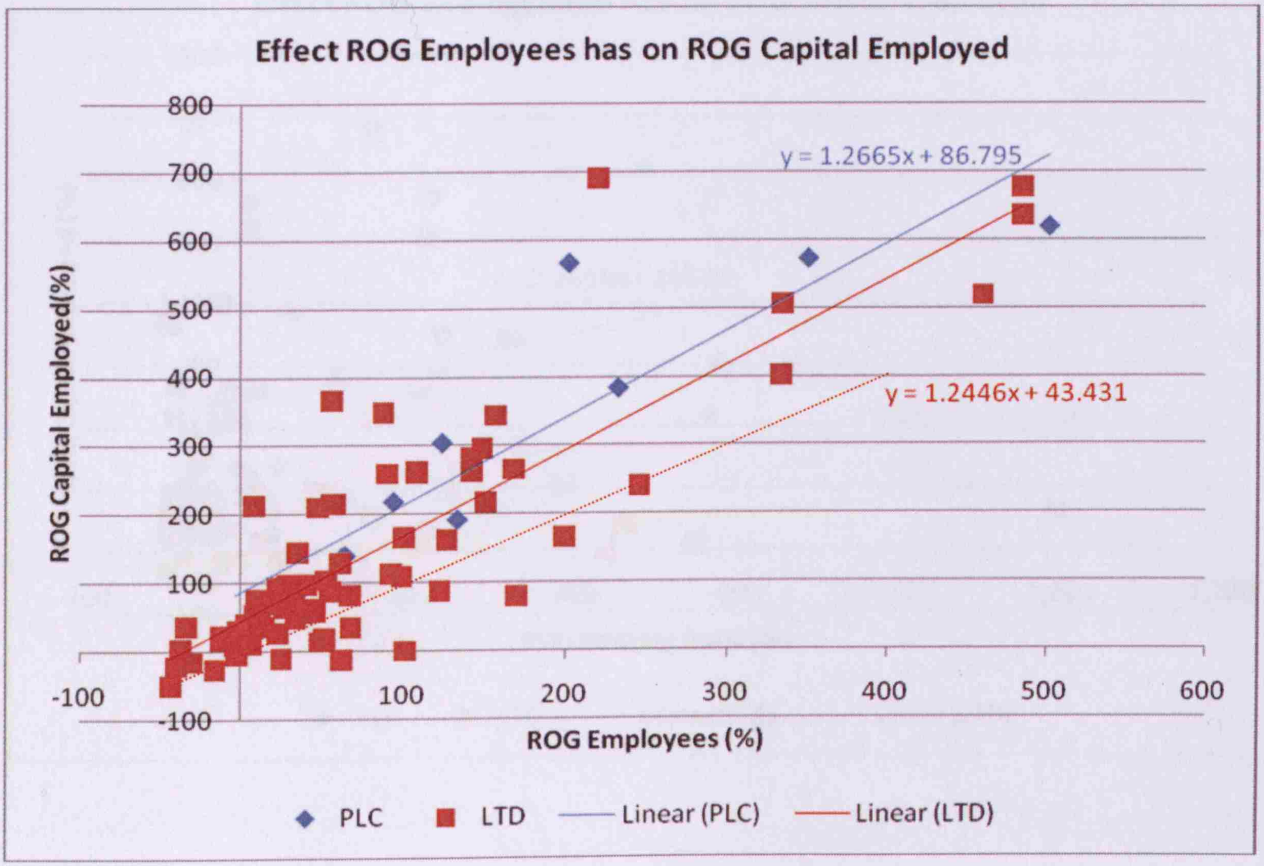
Impact of ROG Profit on ROG Capital Employed



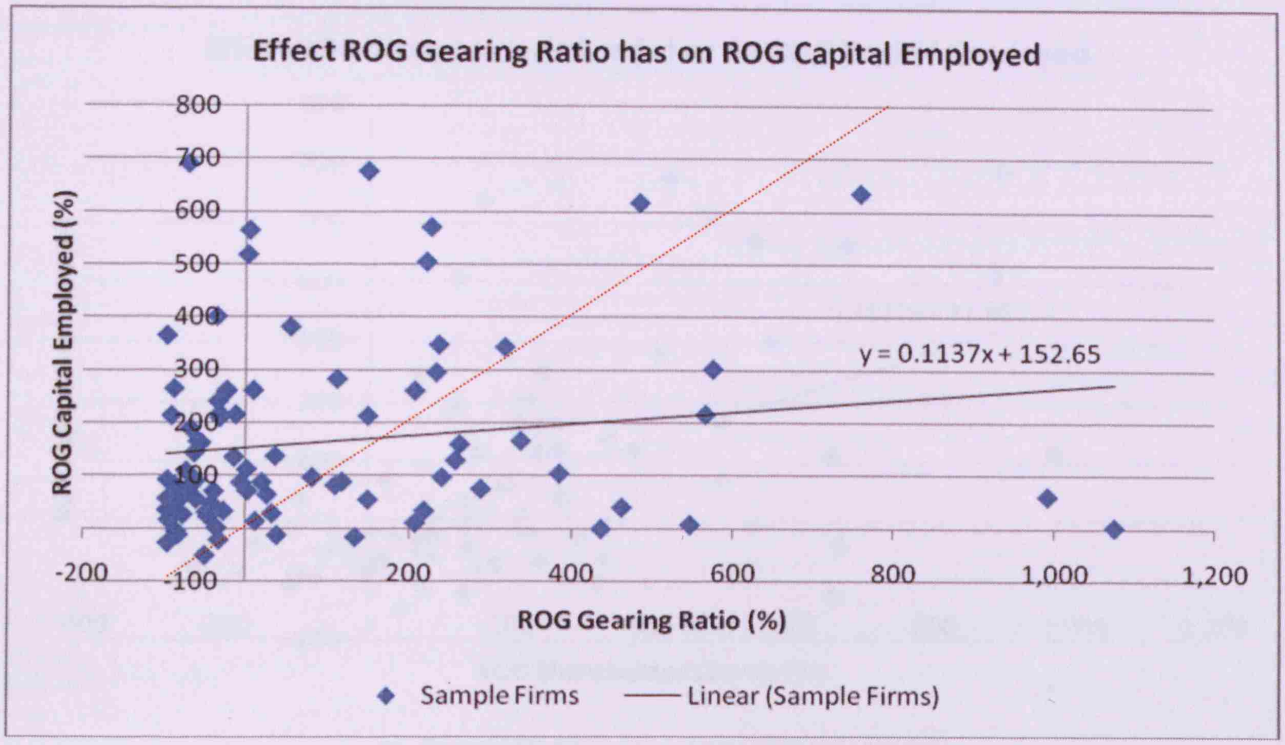


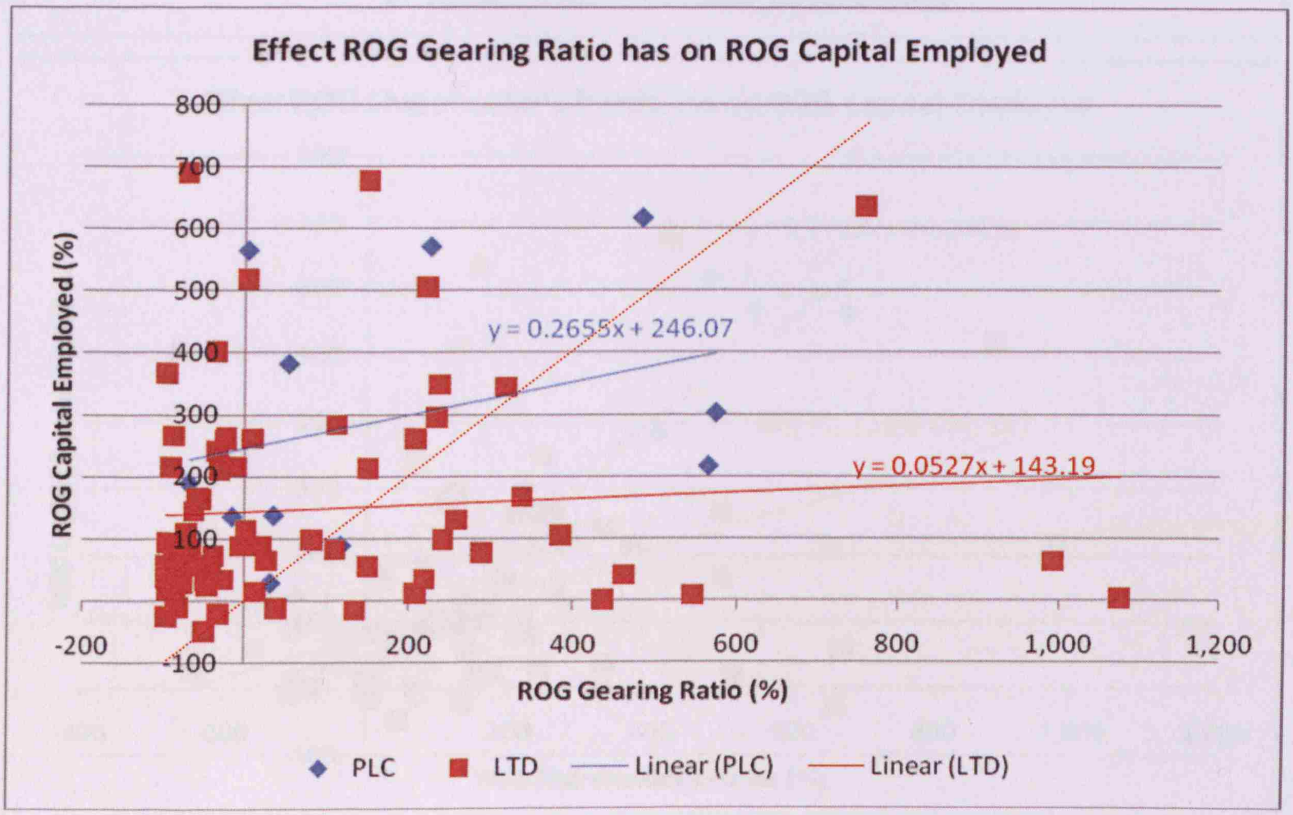
Impact ROG Employees has on ROG Capital Employed



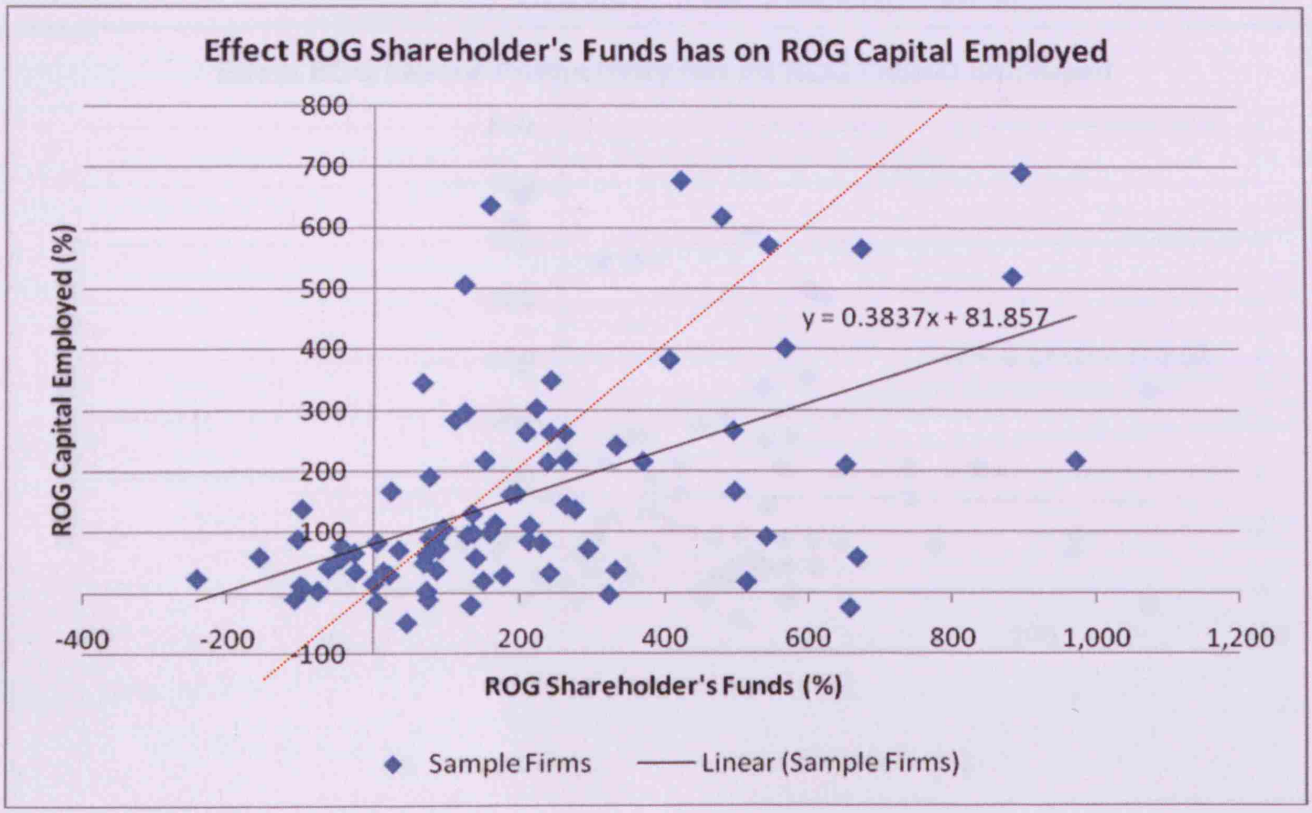


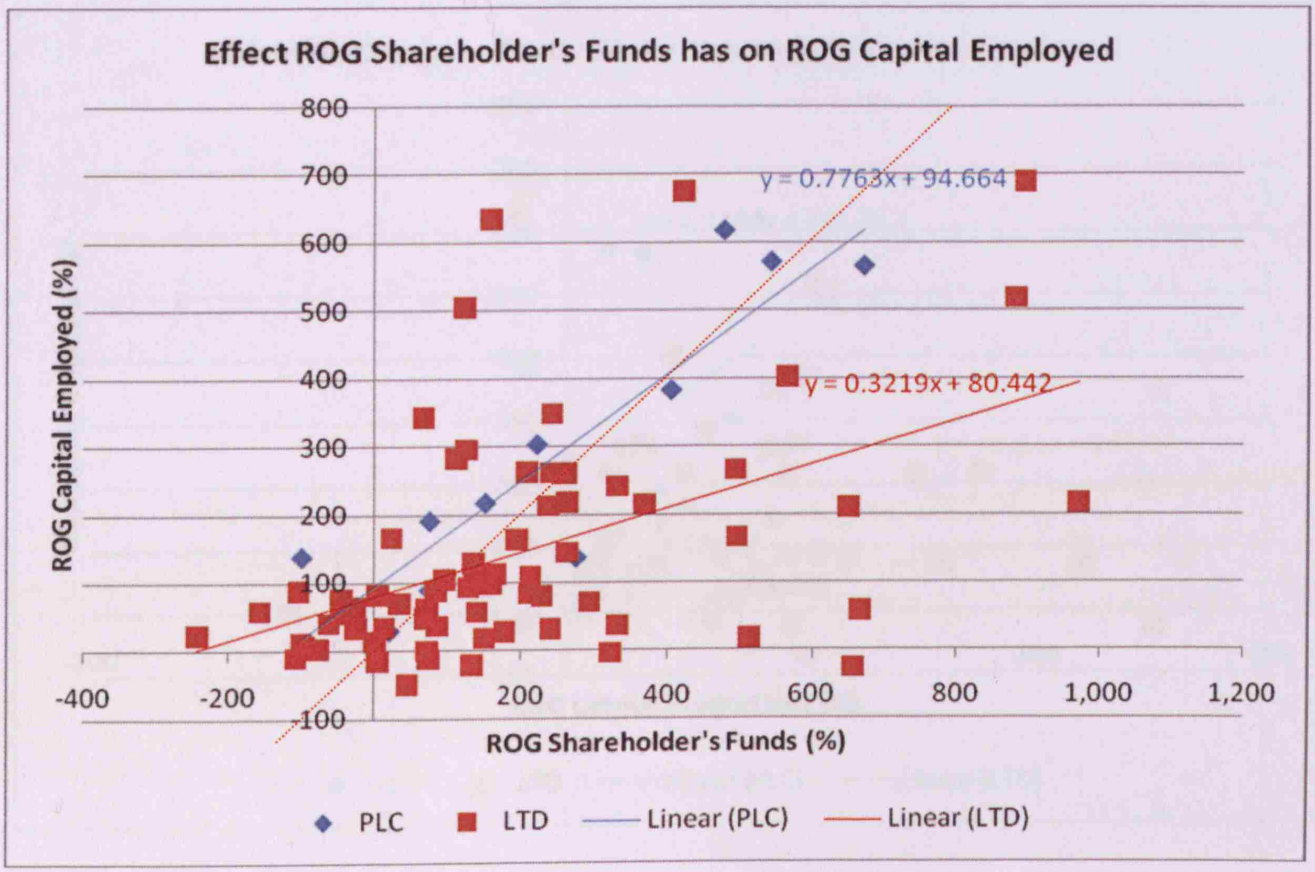
Impact of ROG Gearing Ratio on ROG Capital Employed



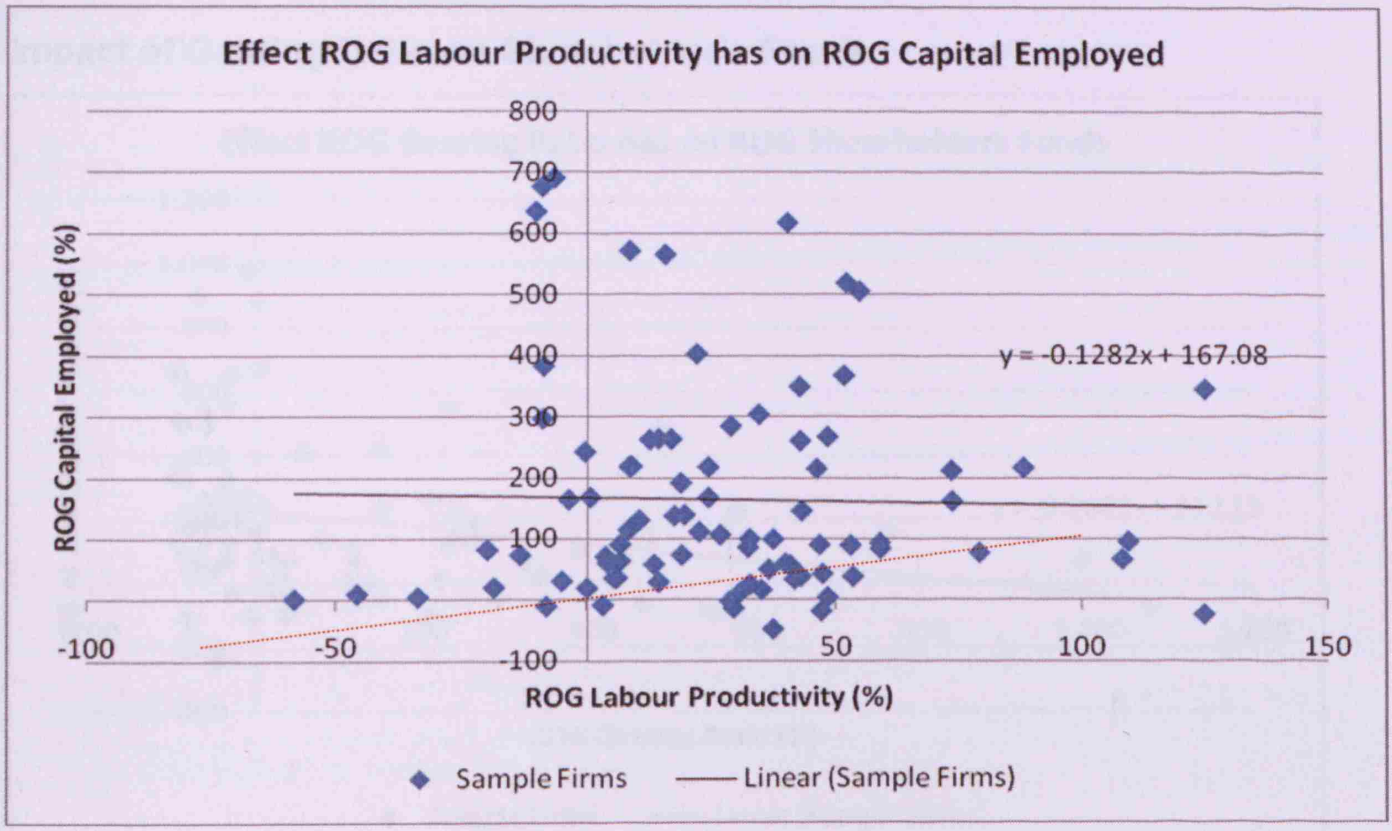


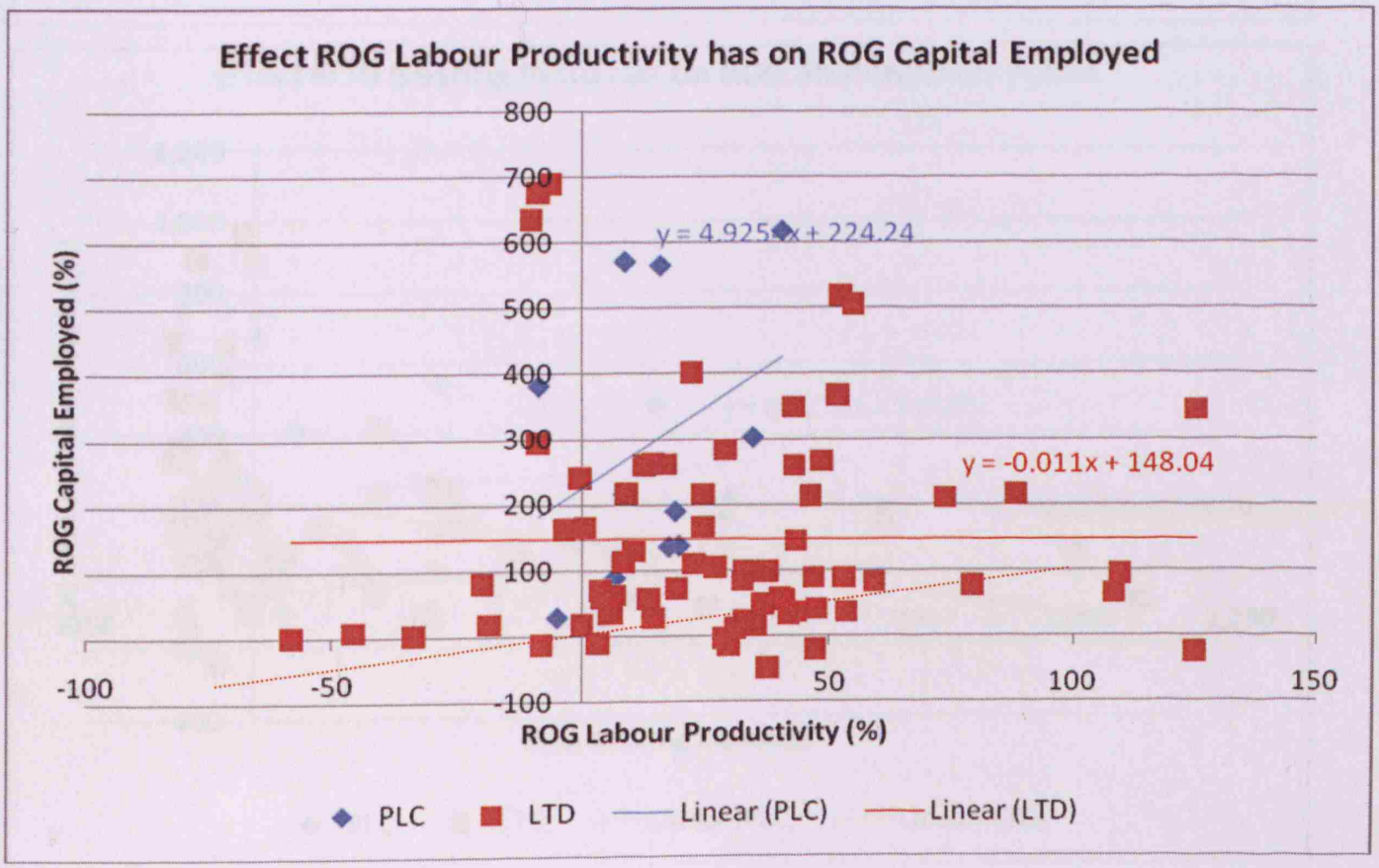
Impact of ROG Shareholders' Funds on ROG Capital Employed





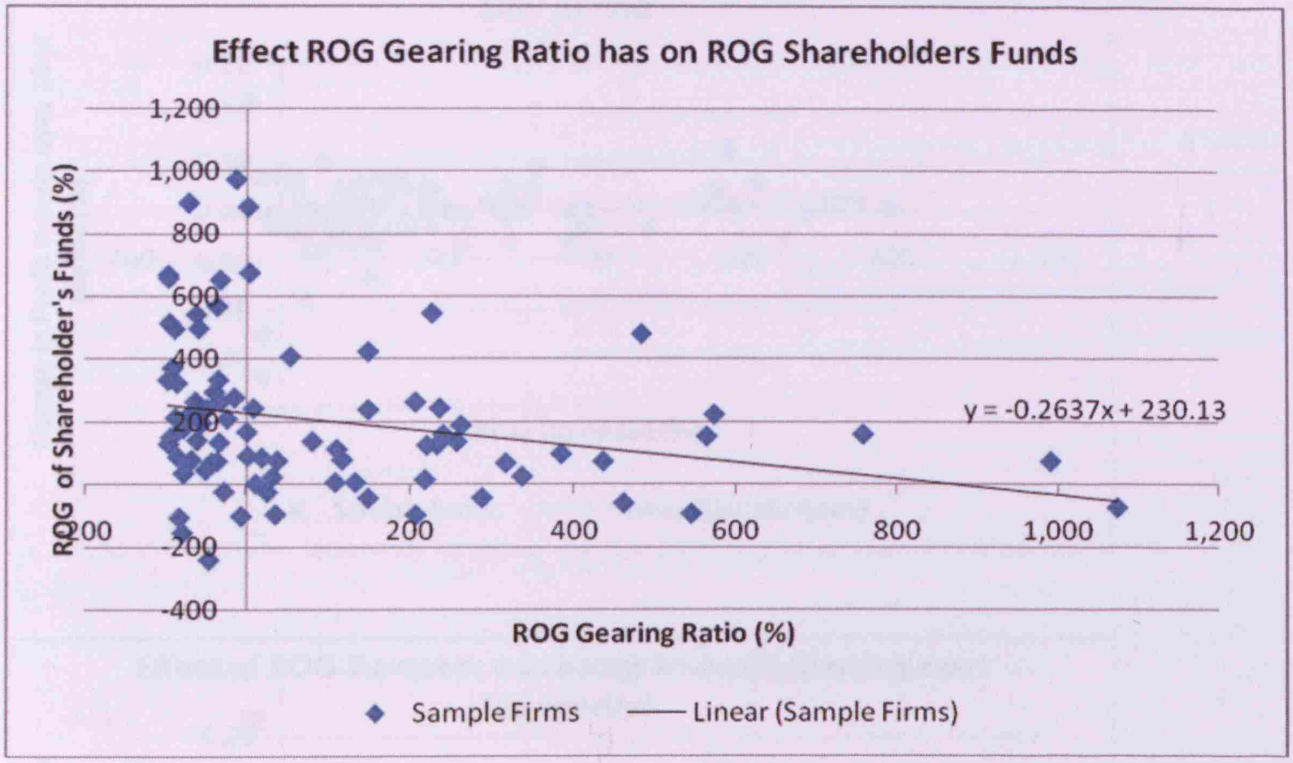
Impact of ROG Labour Productivity on ROG Capital Employed

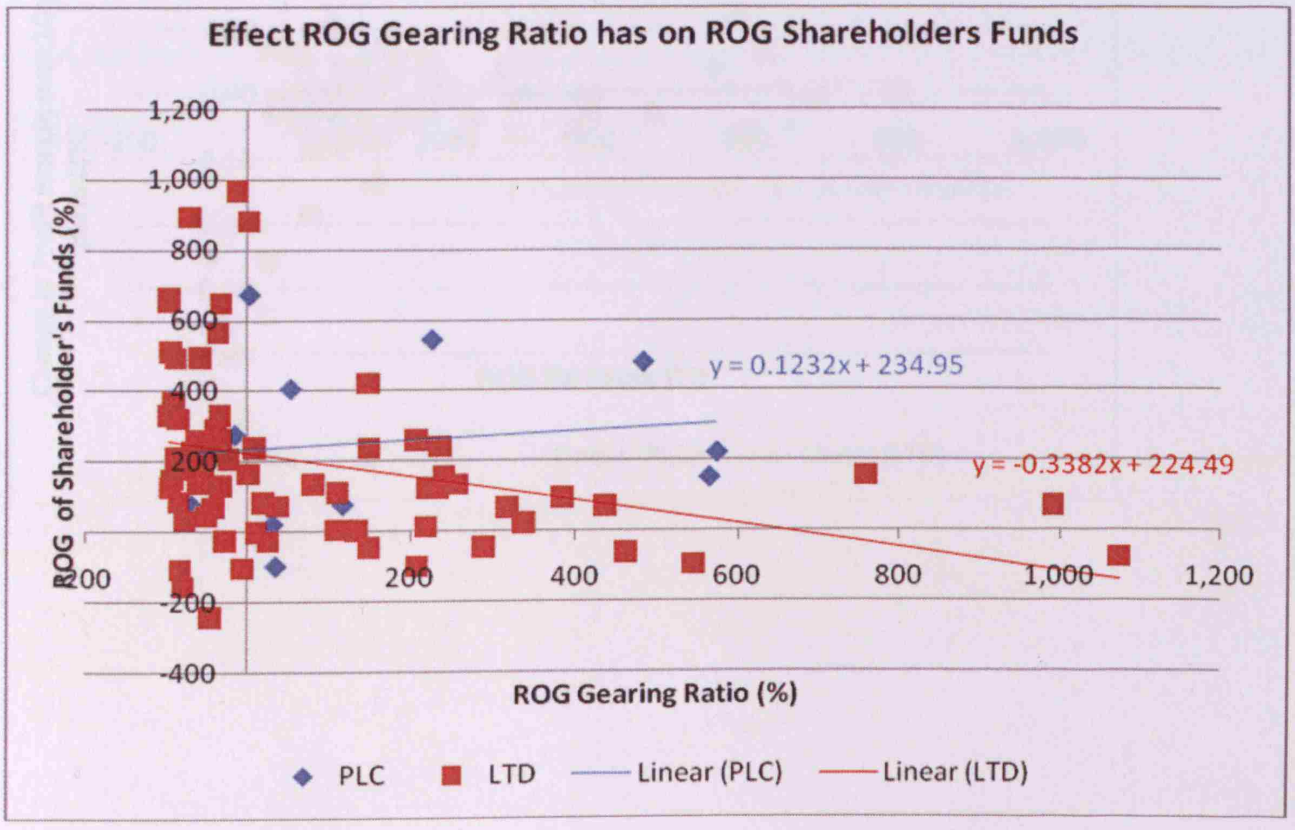




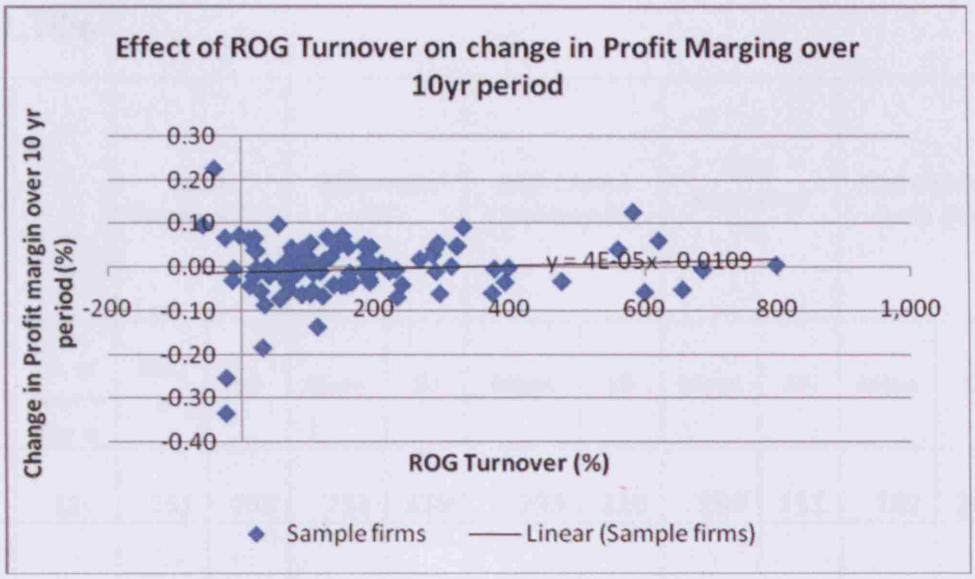
Appendix 4D: Impact of Variables on Shareholder's Funds

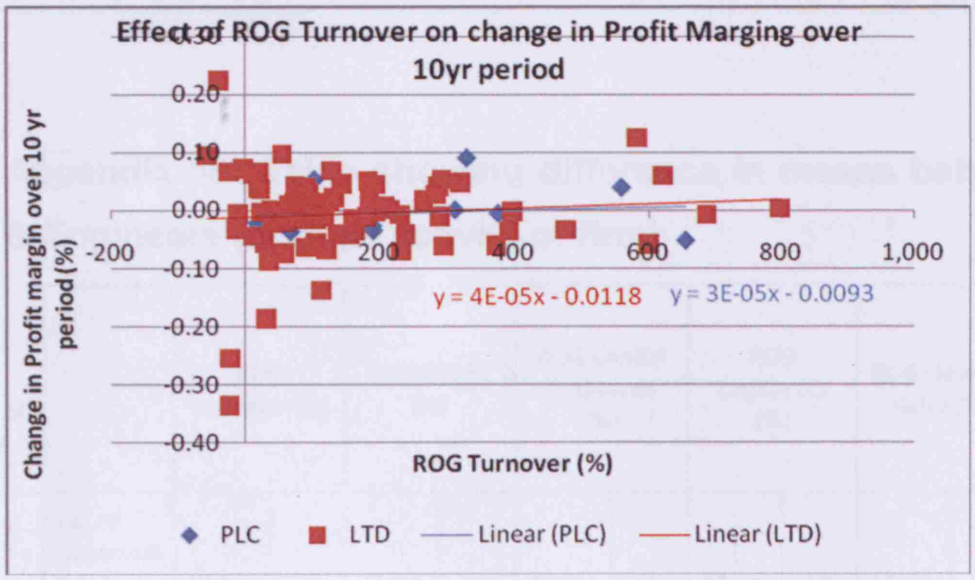
Impact of Gearing Ratio on Shareholder's Funds





Appendix 4E: Impact of ROG Turnover on the change in Profit Margin over 10yrs





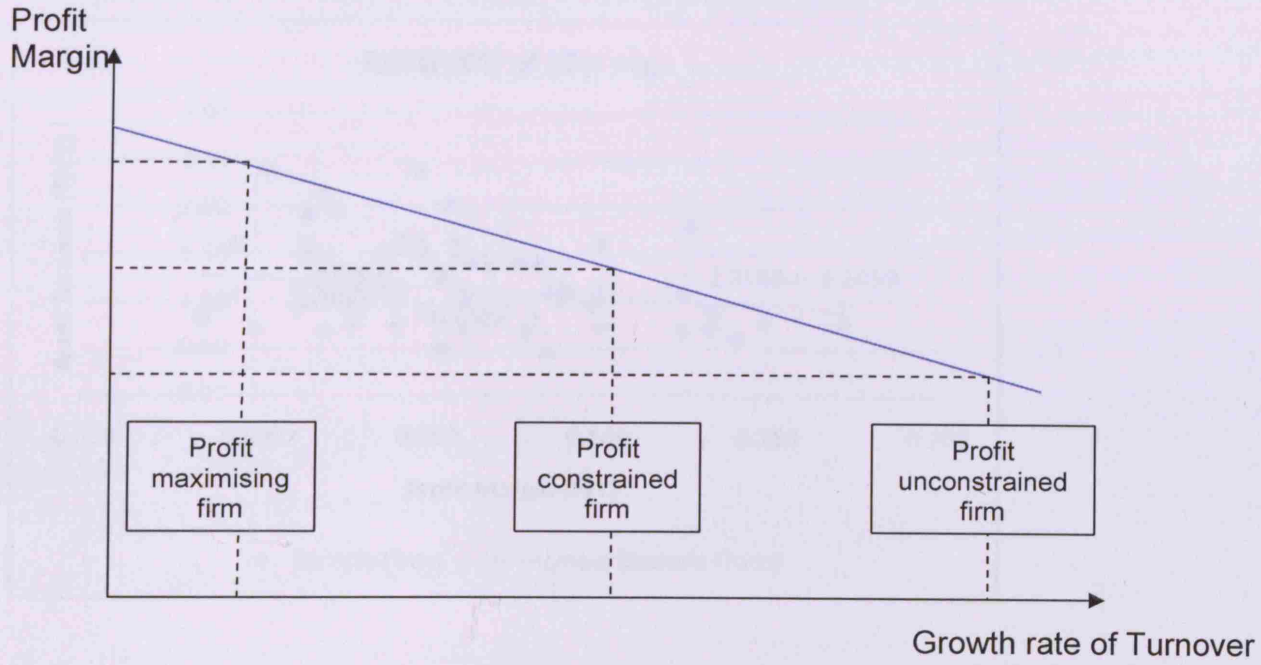
Appendix 5A: Table showing difference in means between PLCs & LTDs

est for significance of difference of means		ROG Turnover (%)		ROG Profit (%)		ROG Capital Employed (%)		ROG Employees (%)		ROG Gearing Ratio (%)		ROG Shareholders' Funds (%)		ROG Labour Productivity (%	
Ownership Types	no. of observations	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
UK PLCs	11	251	208	233	339	295	210	164	151	182	243	257	242	1.8	2
UK Autonomous LTDs	69	140	140	147	362	146	169	84	115	88	243	237	437	40	2

Appendix 5B: Table showing difference in means between Architects & Engineers (original activity of firm)

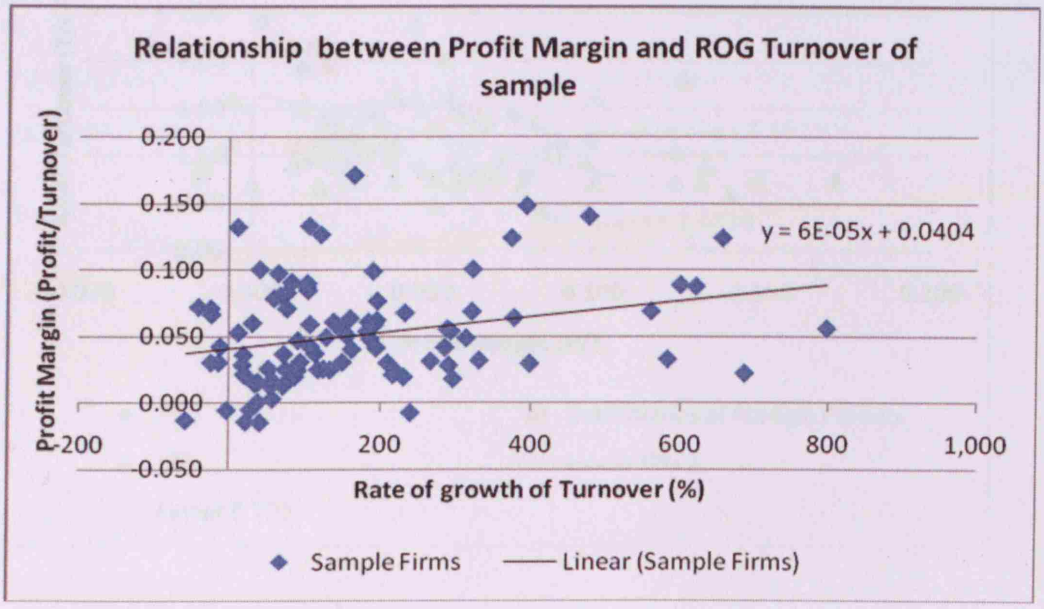
est for significance of difference of means		ROG Turnover (%)		ROG Profit (%)		ROG Capital Employed (%)		ROG Employees (%)		ROG Gearing Ratio (%)		ROG Shareholders' Funds (%)		ROG Labour Productivity (%)	
Original Primary Activity	no. of observations	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Architecture	21	122	113	35	162	141	151	84	114	43	218	178	181	23.4	37
Engineering	46	183	155	269	377	191	195	110	130	91	179	306	516	18	31

Appendix 6: Relationship of sample to Eichner-wood model



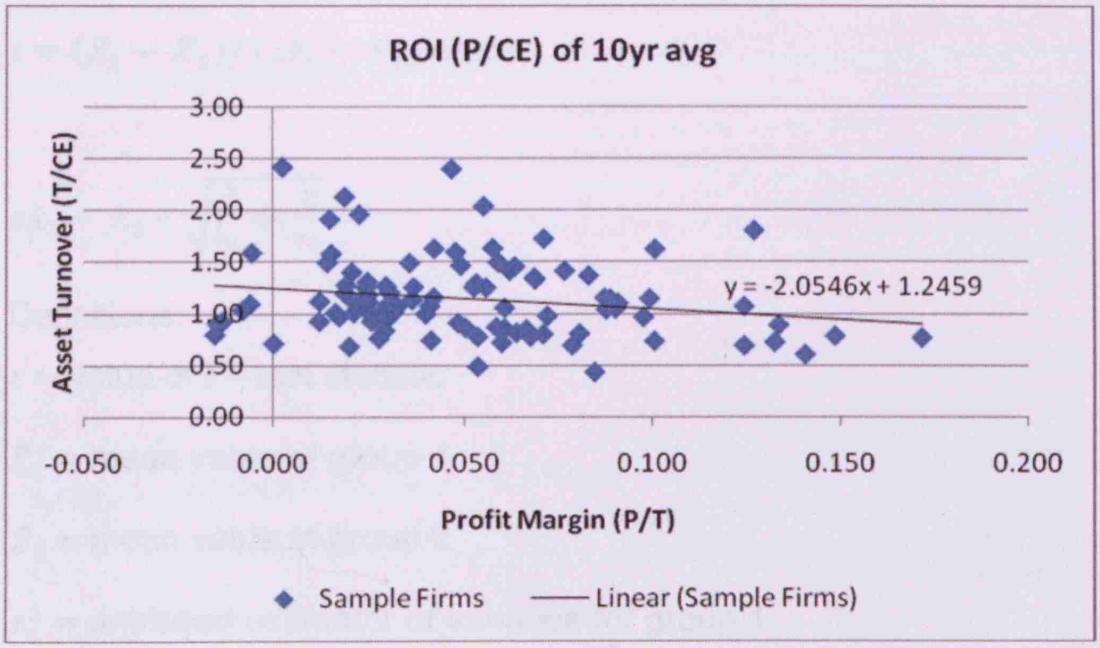
Negative theoretical relationship between Profit Margin and growth rate of Turnover

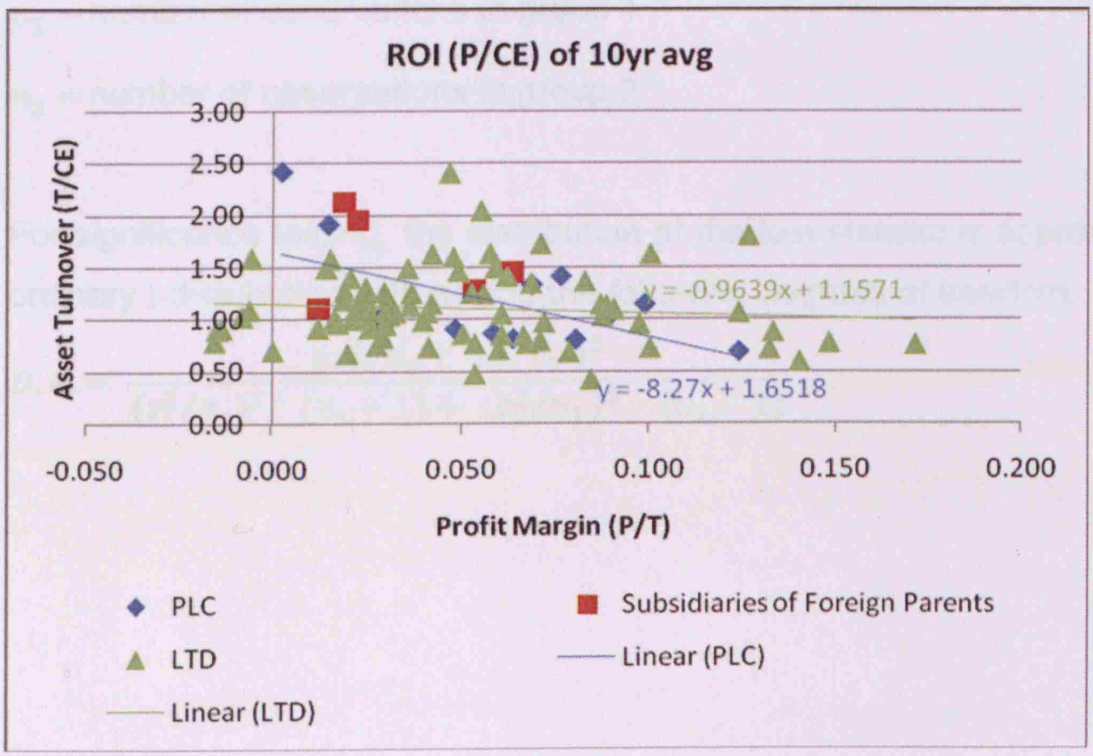
(Adapted from Eichner-Wood model)



Sample exhibiting positive relationship

Appendix 7: Graph showing DuPont relationship for sample





Appendix 8: T – Test Statistical Analyses

$t = (\bar{X}_1 - \bar{X}_2)/ (s\bar{x}_1 - \bar{x}_2)$ where

$$s\bar{x}_1 - \bar{x}_2 = \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$$

Definitions:

t = value of t – test statistic

$\bar{X}_1$ = mean value of group 1

$\bar{X}_2$ = mean value of group 2

s_1^2 = unbiased estimator of variance for group 1

s_2^2 = unbiased estimator of variance for group 1

n_1 = number of observations in group 1

n_2 = number of observations in group 2

For significance testing, the distribution of the test statistic is approximated as ordinary t-distribution with having the following degrees of freedom.

$$D.F. = \frac{(s_1^2/n_1 + s_2^2/n_2)^2}{(s_1^2/n_1)^2/ (n_1 - 1) + (s_2^2/n_2)^2 - (n_2 - 1)}$$

ROG TURNOVER					
T-test			T-test		
p	0.057	mean ROG PLC greater than mean ROG LTD	p	0.044	mean ROG Eng greater than mean ROG Arch
x1	251	PLC	x1	183	ENG
x2	140	LTD	x2	122	ARCH
s1	43198	PLC	s1	24175.19	ENG
s2	19595	LTD	s2	12669.9	ARCH
n1	11	PLC	n1	45	ENG
n2	69	LTD	n2	18	ARCH
sx1 - x2	64.89293		sx1 - x2	35.22939	
t =	1.7		t =	1.7	

ROG PROFIT					
T-test			T-test		
p	0.23	mean ROG PLC greater than ROG LTD mean	p	0.001	mean ROG Eng greater than mean ROG Arch
x1	233	PLC	x1	269	ENG
x2	147	LTD	x2	35	ARCH
s1	114671.4	PLC	s1	141868.3	ENG
s2	131359.3	LTD	s2	26338.22	ARCH
n1	11	PLC	n1	45	ENG
n2	69	LTD	n2	18	ARCH
sx1 - x2	111.0335		sx1 - x2	67.94015	
t =	0.8		t =	3.4	

ROG CAPITAL EMPLOYED					
T-test			T-test		
p	0.023	mean ROG PLC greater than mean ROG LTD	p	0.14	Mean ROG Eng greater than mean ROG Arch
x1	295	PLC	x1	191	ENG
x2	146.11	LTD	x2	141	ARCH
s1	44067.533	PLC	s1	37907.835	ENG
s2	28458.233	LTD	s2	22909.499	ARCH
n1	11	PLC	n1	45	ENG
n2	69	LTD	n2	18	ARCH
sx1 - x2	66.472382		sx1 - x2	45.99072	
t =	2.2		t =	1.1	

ROG EMPLOYEES					
T-test			T-test		
p	0.06	mean ROG PLC greater than mean ROG LTD	p	0.22	Mean ROG Eng greater than mean ROG Arch
x1	164	PLC	x1	110	ENG
x2	84	LTD	x2	84	ARCH
s1	22704	PLC	s1	16905.27	ENG
s2	13334	LTD	s2	13022.38	ARCH
n1	11	PLC	n1	45	ENG
n2	69	LTD	n2	18	ARCH
sx1 - x2	47.51076		sx1 - x2	33.15325	
t =	1.7		t =	0.8	

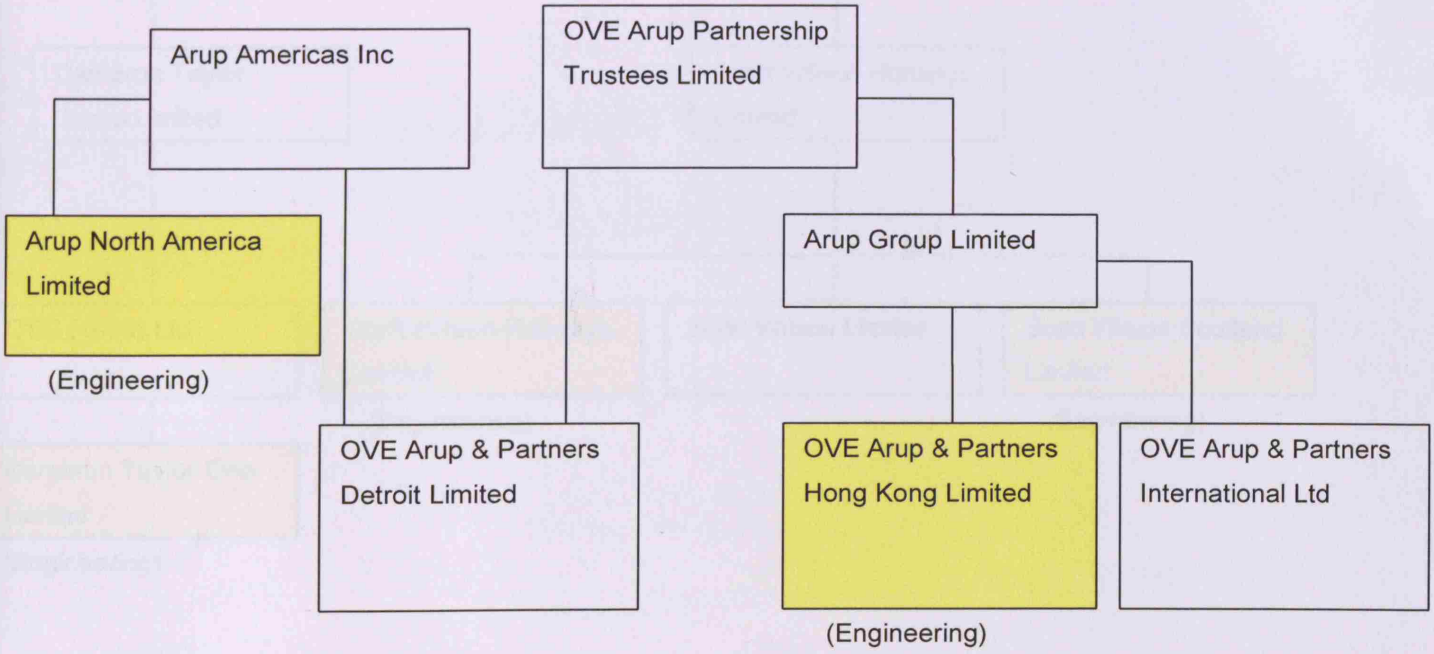
ROG GEARING RATIO					
T-test			T-test		
p	0.13	mean ROG PLC greater than mean ROG LTD	p	0.21	mean ROG Eng greater than mean ROG Arch
x1	182	PLC	x1	91	ENG
x2	88	LTD	x2	43	ARCH
s1	58927.63	PLC	s1	32199.4	ENG
s2	59271.03	LTD	s2	47723.08	ARCH
n1	11	PLC	n1	45	ENG
n2	69	LTD	n2	18	ARCH
sx1 - x2	78.84198		sx1 - x2	58.02434	
t =	1.2		t =	0.8	

ROG SHAREHOLDERS' FUNDS					
T-test			T-test		
p	0.41	mean ROG PLC greater than mean ROG LTD	p	0.08	mean ROG Eng greater than mean ROG Arch
x1	257	PLC	x1	306	ENG
x2	237	LTD	x2	178	ARCH
s1	58755	PLC	s1	266269	ENG
s2	190930	LTD	s2	32611	ARCH
n1	11	PLC	n1	45	ENG
n2	69	LTD	n2	18	ARCH
sx1 - x2	90.046833		sx1 - x2	87.913598	
t =	0.2		t =	1.5	

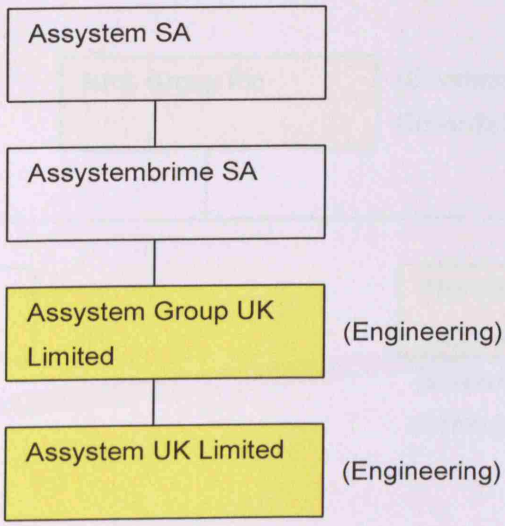
ROG LABOUR PRODUCTIVITY					
T-test			T-test		
p	0.02	mean ROG PLC greater than mean ROG LTD	p	0.28	mean ROG Eng greater than mean ROG Arch
x1	2	PLC	x1	18	ENG
x2	23	LTD	x2	23	ARCH
s1	786.8352	PLC	s1	988.8612	ENG
s2	911.7495	LTD	s2	1356.373	ARCH
n1	11	PLC	n1	45	ENG
n2	69	LTD	n2	18	ARCH
sx1 - x2	9.205663		sx1 - x2	9.865535	
t =	-2.3		t =	-0.6	

Appendix 9: Related Firms within Survey sample

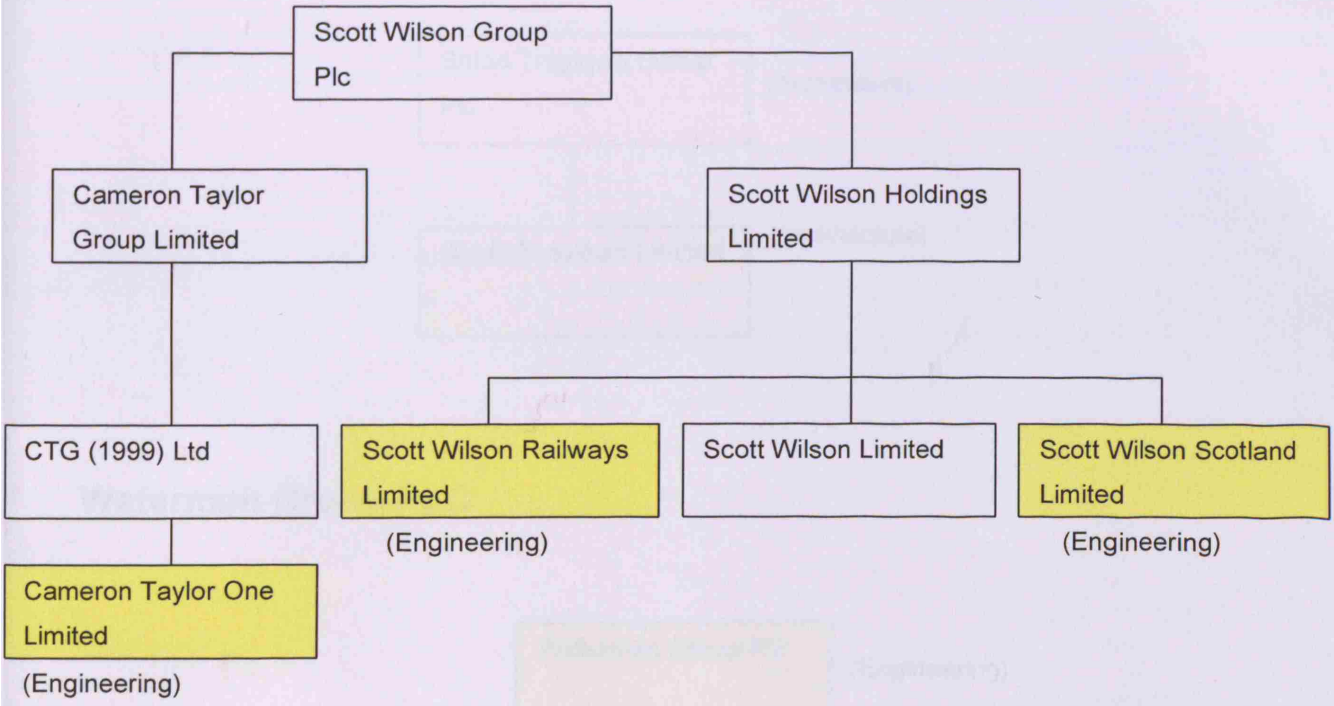
Arup Group Limited



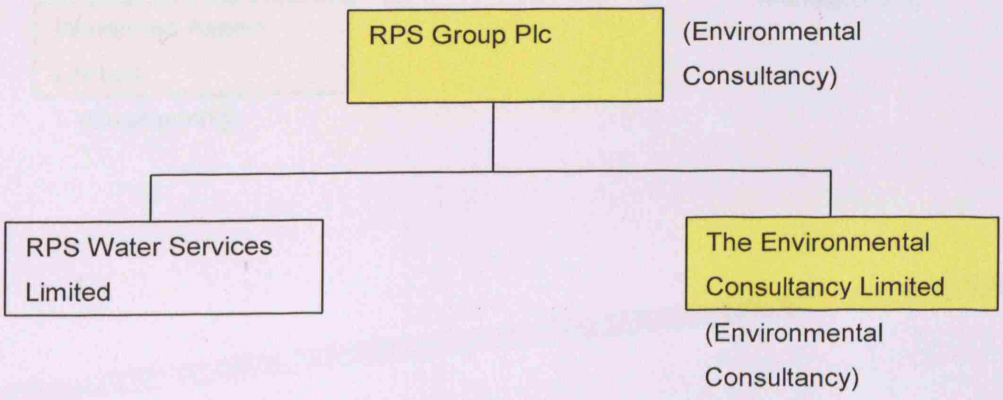
Assystem Group Limited



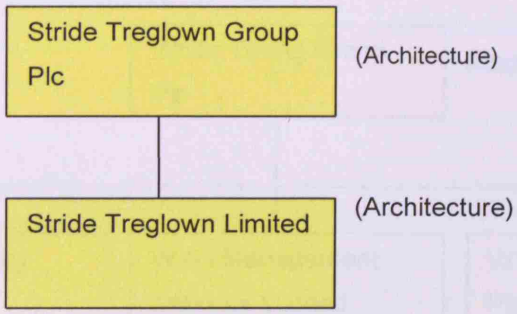
Scott Wilson Group PLC



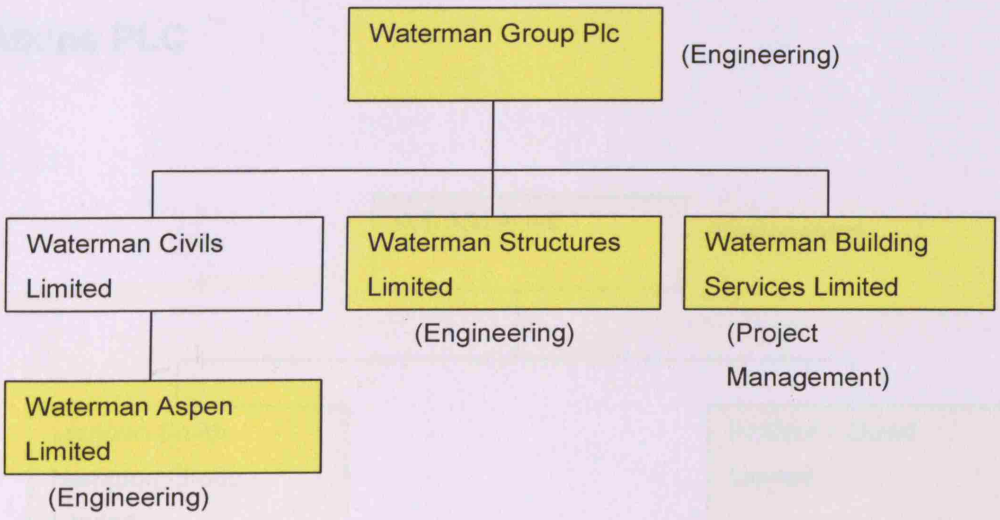
RPS Group PLC



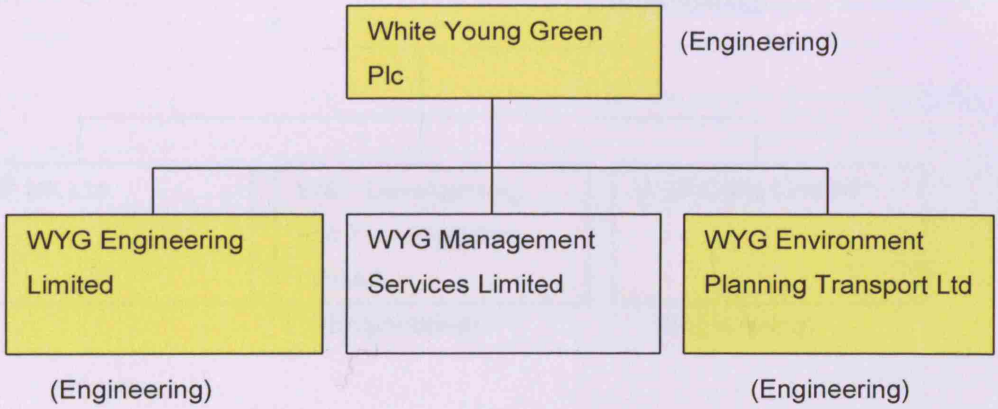
Stride Treglown Group PLC



Waterman Group PLC



White Young Green PLC



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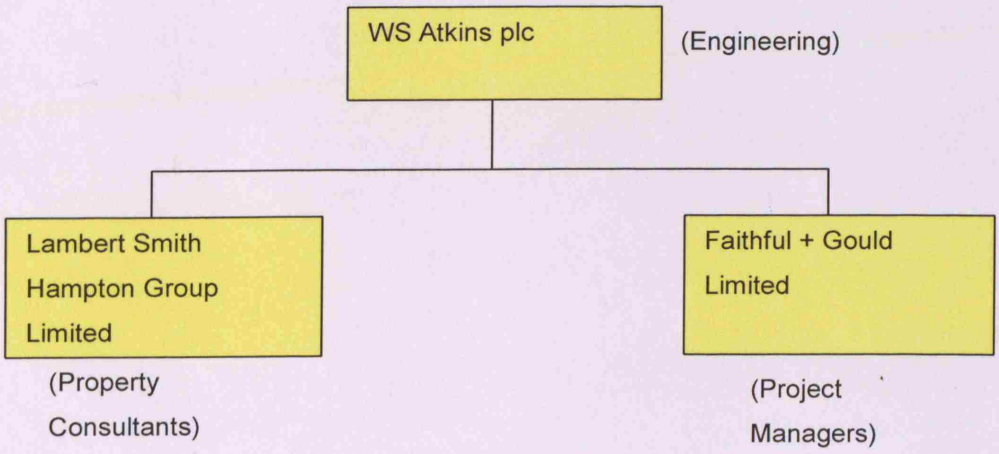

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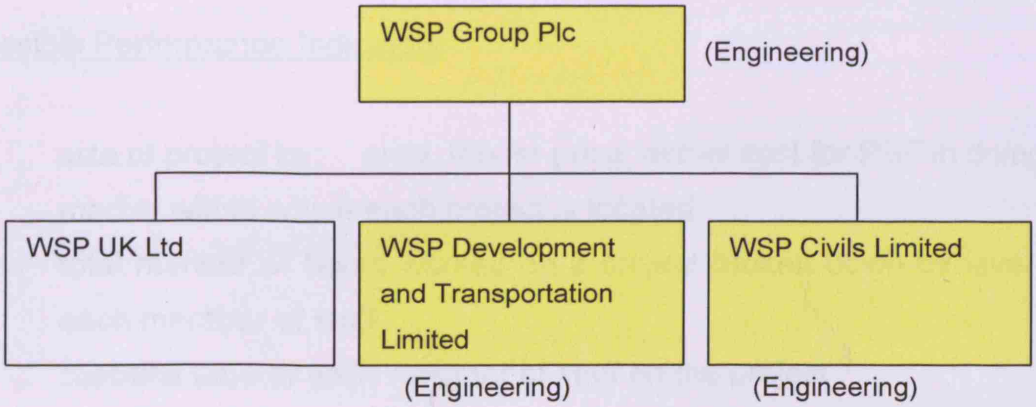
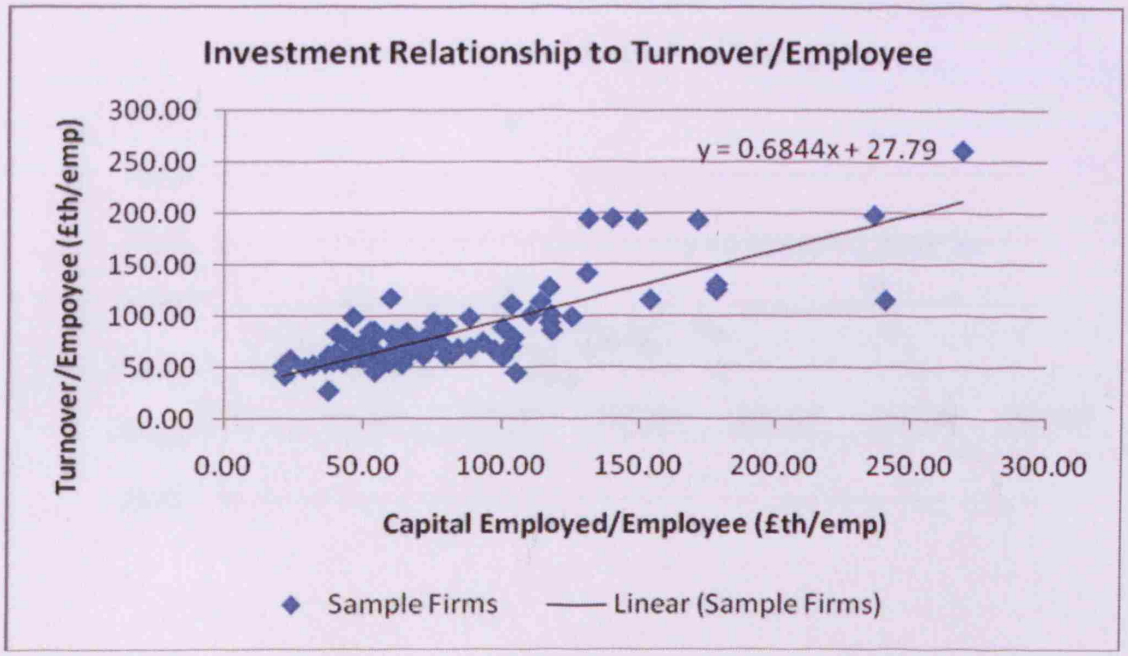


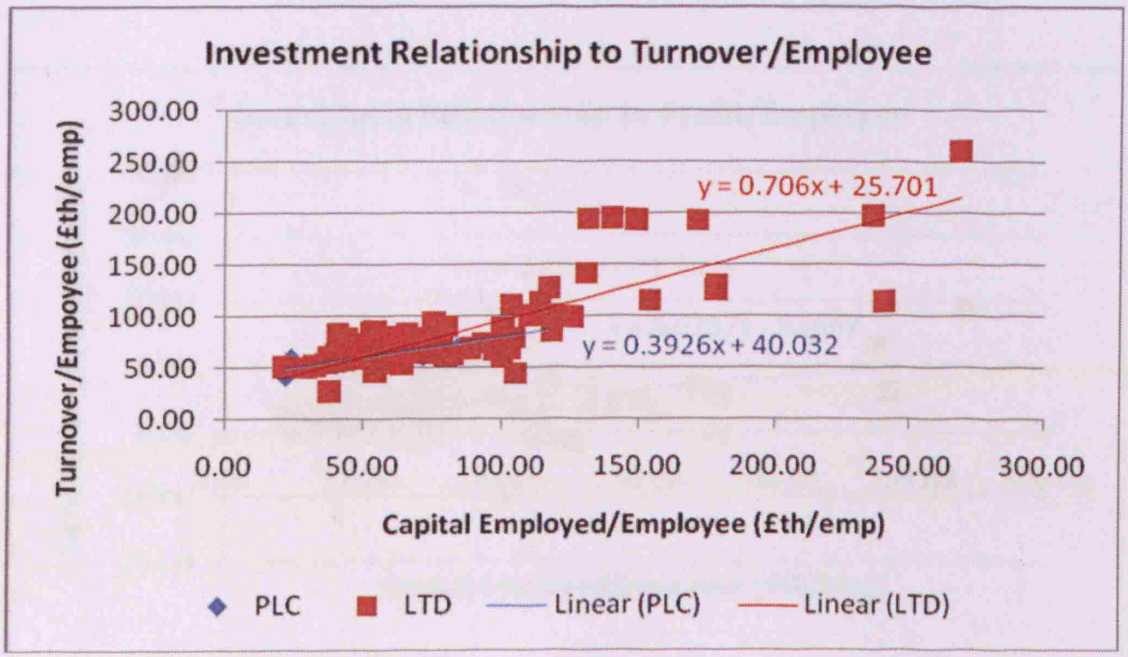
Appendix 10: Possible Key Performance Indicators

Possible Performance Indicators

1 size of project by: area, tender price, actual cost for PSF in doing the work
2 market within which each project is located
3 total number of hours worked on a project broken down by level of expertise of each member of staff
4 cost/unit time of each member of staff on the project

Appendix 11a: Investment Relationship to Turnover/Employee





Appendix 11b: Investment Relationship to Profit/Employee